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FOSSIL BRYOZOA

IN THE

DEPARTMENT OF GEOLOGY

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CATALOGUE
OF
THE FOSSIL BRYOZOA
IN THE
DEPARTMENT OF GEOLOGY
BRITISH MUSEUM
(NATURAL HISTORY).

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THE CRETACEOUS BRYOZOA.

VOLUME I.

BY
J. W. GREGORY, D.Sc., F.G.S.

x ref.

WITH SEVENTEEN PLATES.

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PREFACE.

In the earlier work on the "Jurassic Bryozoa" (May, 1896), the Author gave a valuable Introduction upon the structure and affinities of the group.

The present volume was intended to embrace the whole of the Cretaceous Bryozoa, but the extent of the collection to be catalogued was not fully estimated, and it is found that there are ample materials for two volumes. Much labour has been entailed by Dr. Gregory in the task which he has undertaken, and great credit is due to him for having completed the first half of the Catalogue. This enables the present work to be brought out at once, with its full complement of illustrations, and it is hoped that the second volume may be issued in the new year.

HENRY WOODWARD.

Geological Department,
British Museum (Natural History).
November 20, 1899.

AUTHOR'S PREFACE.

The collection of Cretaceous Bryozoa in the British Museum has increased so largely during the past three years, that the preparation of the present Catalogue has been delayed. Collections of Bryozoa have been received from Rügen, Bohemia, Hannover, Touraine, and New Jersey, so that the Museum now possesses representatives of every important Cretaceous Bryozoan fauna. Unfortunately the North American collection was received too late to be included in this volume, and of the extensive series of specimens from Rügen only a small part has yet been identified and incorporated in the collection.

For gifts of Cretaceous Bryozoa the Museum is indebted to Dr. H. P. Blackmore, Miss Busk, Prof. H. Credner, Mr. G. C. Crick, Mr. A. M. Davies, Mr. G. E. Dibley, Prof. Anton Fric, Mr. Wm. Gamble, Mr. Wm. Hill, Mr. A. H. Hinton, Dr. W. F. Hume, Prof. T. R. Jones, and Mr. Joseph Wright.

It is hoped to include in the second volume the general introduction to the Cretaceous Bryozoa, a list of the localities with their horizons, and a bibliography.

An effort is being made to include in the Catalogue every recorded Cretaceous species, so that the Index may serve as a complete record of the Cretaceous Bryozoa; but many species have been founded on inadequate descriptions or unrecognizable figures, and in such cases the suggestions as to the systematic position of the species are of doubtful value. In reference to horizons, it is deplorable that in the older collections and literature little attention was paid to the exact zones.

In the case of some important specimens, the only available information is, that they come from the Chalk of Kent or Sussex. The materials are not in existence for a full zonal study of the Cretaceous Bryozoa, which is impossible while the systematic arrangement of the group is so unsatisfactory. The effort has been made to improve the classification of the fauna, and thus to assist the subsequent zonal study, which is being rendered possible by such collections as those of Dr. A. W. Rowe.

I have pleasure in expressing my thanks to Mr. R. Kirkpatrick for his ever ready assistance in referring to the recent Bryozoa in the Zoological Department; to Mr. A. Smith Woodward for many editorial suggestions; to Mr. C. D. Sherborn for opportunities of reference to his *Index Animalium*; to Miss G. M. Woodward and Miss Drake for the care with which they have drawn the plates; and to Mr. W. C. Newton, an Attendant in the Department, for the intelligence and care with which he has prepared the index.

A list of the collections included in the Museum series of Cretaceous Bryozoa will be added in the second volume; but I cannot pass without reference the magnificent collection made by Mr. Wm. Gamble from the Chalk of Chatham. He presented a small series to the Museum in 1889, and since then has continued his patient search which has enriched the Museum collection with its finest series of Cretaceous Bryozoa.

J. W. GREGORY.

Geological Department,
British Museum (Natural History).
October 24, 1899.

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SYSTEMATIC DESCRIPTION.

GROUP BRYOZOA, Ehrenberg, 1831.

CLASS ECTOPROCTA, Nitsche.

SUBCLASS GYMNOLÆMATA, Allman.

Order CYCLOSTOMATA, Busk.

Bryozoa in which the zoœcia are simple, elongated, and cylindrical, and typically grow in tufts or sheets formed of radiating zoœcia. Mesopores are rarely, if ever, present. Mouths circular, and generally raised above the surface of the zoarium. Oœcia of enlarged zoœcia. Appendages generally absent.

Suborder TUBULATA, Gregory.

Zoarium formed of monomorphic zoœcia, not divided into internodes; zoœcia of elongated tubes grouped into bundles or sheets, or linear series.

Family DIASTOPORIDÆ.

DIAGNOSIS.

Cyclostomata Tubulata in which the zoœcia are simple, open tubes, which either grow as linear series or as encrusting or erect sheets. The sheets may be coiled into hollow tubes. The zoarium is exceptionally massive. The zoœcia may be wholly immersed or partly free. Appendages absent.

STOMATOPORA, Bronn,[1] 1825.

SYNONYMS.

Alecto, Lamouroux, 1821.
Aulopora, pars, Goldfuss, etc.

DIAGNOSIS.

Diastoporidæ with the zoœcia forming flat adnate zoaria, composed of uniserial lines. These zoœcial lines branch dichotomously, and sometimes anastomose into an irregular reticulate web. The cell mouth is flush or slightly raised; zoœcia tubular or subpyriform.

TYPE SPECIES.

S dichotoma, Lamouroux, 1821.

CRETACEOUS REPRESENTATIVES.

The Cretaceous members of the genus *Stomatopora* agree fairly well with the typical Jurassic species; there appears no more serious difficulty in restricting the genus to uniserial zoaria than in the case of the Jurassic forms. The Cretaceous 'species,' or the groups of individuals which pass for 'species,' are, however, more irregular than their Jurassic predecessors; cases are not unfrequent in which two zoœcia occurring side by side render the zoarium locally biserial. Such instances mark an approach to the corresponding variation in narrow-banded *Proboscinæ*, in which the zoarium is locally uniserial.

The most aberrant of Cretaceous *Stomatoporæ* is figured on Pl. I. Fig. 12; it is remarkable for the extreme height of the peristomal portions of the zoœcia, which are of a height corresponding to that seen in recent specimens of *Tubulipora* or *Phalangella*.

1. Stomatopora granulata (M. Edwards), 1838.

SYNONYMY.

Alecto granulata, M. Edwards, 1838. Mém. Cris.: Ann. Sci. nat., Zool., ser. 2, vol. ix. p. 205, pl. xvi. figs. 3, 3*a*.
,, ,, Michelin, 1845. Icon. Zooph. p. 202, pl. lii. fig. 4.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 628, figs. 5–8.

---

[1] Bronn: Syst. Pflanz. p. 27, pl. vii. fig. 3.

non[1] *Alecto granulata*, Johnston (1847), Landsborough (1852), Alder (1857), Busk (1875), etc.
Stomatopora ,, Bronn, 1848. Ind. Pal., Nomencl., p. 1202.
,, ,, d'Orbigny, 1854. Bry. Crét. p. 836.
? ,, ,, var. *minor*, Waters, 1884. Cycl. Austr.: Quart. Journ. Geol. Soc. vol. xl. p. 688.
,, ,, *pars*, Waters, 1887. Cycl. N. Zeal.: *ibid.* vol. xliii. p. 341.
,, ,, Pergens, 1890. Revision, p. 329, pl. xi. fig. 2.
,, ,, var. *gigantea*, Pergens, 1890. Revision, p. 330.
,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 464.
,, ,, var. *a*, Vine, 1890. *Ibid.* p. 465.
,, ,, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 372, pl. xvii. fig. 3.
,, ,, Vine, 1891. *Ibid.* p. 372.
,, ,, var. *incrassata*, Vine, 1891. Cret. Pol.: Rep. Brit. Assoc. 1890, p. 396.
,, ,, var. *gigantea*, Vine, 1893. Compl. Rep.: *ibid.* 1892, p. 307.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 203.
,, ,, Pergens, 1895. Bry. Arche de Lèves. *ibid.* vol. viii. p. 132.
,, ,, Pergens, 1895. Bry. Cachemb.: *ibid.* vol. viii. p. 182.
,, ,, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 152.
,, ,, Canu, 1897. Bry. St. Cal.: *ibid.* p. 743.
Alecto, sp., Woodward, 1833. Geol. Norf. p. 46, pl. iv. fig. 16.
? *Aulopora dichotoma* (*non* Lamouroux), Hagenow, 1839. Mon. rügen. Kr.: Neu. Jahrb. 1839, p. 291.
,, ,, (*non* Lamouroux), Reuss, 1846. Verst. böhm. Kr. p. 66, pl. xv. figs. 32–4.
Stomatopora simplicissima, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 101, pl. v. figs. 26–8.
Alecto ramea (*non* Blainv.), Lonsdale, 1850. In Dixon's Geol. Suss. p. 268, pl. xviii. figs. 35, 40, 41.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 630, figs. 9–12.
Stomatopora ,, d'Orbigny, 1854. *Ibid.* p. 842.
,, ,, Peron, 1888. Craie Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. pp. 225, 264.
,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 465.
,, ,, Vine, 1891. Cret. Pol.: Rept. Brit. Assoc. 1890, p. 396.
,, ,, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 371, pl. xvii. fig. 2.

---

[1] The species described by these authors is a recent form, *Stomatopora trahens* (Couch): Cat. Jur. Bry. p. 48.

Stomatopora ramea (*non* Blainv.), Vine, 1892. Add. Cret. Pol.: *ibid.* vol. xii. pt. 2, p. 151.
Aulopora ramosa, von Hagenow, 1839. Mon. rüg. Kr.: Neu. Jahrb. 1839, p. 291.
,, ,, von Römer, 1840. Verst. nordd. Kr. p. 18, pl. v. fig. 16.
Alecto ramosa, von Hagenow, 1846. In Geinitz, Grundr. Verst. pt. ii. p. 629.
Stomatopora ramosa, Boll, 1853. Mekl. dil. Kreidever.: Arch. Ver. Naturg. Meckl. vol. vii. p. 83.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 13.
,, ,, Stolley, 1892. Kr. Schl. Holst.: Mitt. min. Inst. Kiel, vol. i. p. 245.
Alecto reticulata, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 175.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 630, figs. 1–4.
Stomatopora ,, d'Orbigny, 1854. *Ibid.* p. 841.
,, ,, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. mal. Belg. vol. xxi., Mém. p. 199.
Alecto plicata, d'Orbigny, 1851. Bry. Crét. pl. 629, figs. 12–15.
Stomatopora plicata, d'Orbigny, 1854. *Ibid.* p. 839.
,, ,, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. mal. Belg. vol. xxi., Mém. p. 199.
Alecto linearis, d'Orbigny, 1851. Bry. Crét. pl. 629, figs. 5–8.
Stomatopora linearis, d'Orbigny, 1854. *Ibid.* p. 838.
,, ,, var. *mortoni*, Vine, 1889. Pol. Grsd.: Proc. Yorks. Geol. Soc. vol. xi. pt. 2, p. 262, pl. xii. figs. 1–1*d*.
,, ,, Vine, 1891. Cret. Pol.: Rep. Brit. Assoc. 1890, p. 390.
Alecto gracilis (*non* Edw.), d'Orbigny, 1850. Prod. Pal. vol. ii. p. 109.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 629, figs. 1–4.
Stomatopora subgracilis, d'Orbigny, 1854. *Ibid.* p. 838.
,, *gracilis* (*non* Edw.), Vine, 1884. Fourth Rep. Polyz.: Rep. Brit. Assoc. 1883, p. 163.
,, ,, (*non* Edw.), Vine, 1885. Camb. Grsd.: Proc. Yorks. Geol. Soc. vol. ix. pt. 1, p. 13, pl. ii. fig. 7.
non ,, ,, var. *delicatula*, Vine, 1891. Polyz. Red Chalk: *ibid.* vol. xi. p. 371, pl. xvii. fig. 1.
Stomatopora graciliformis, Vine, 1889. Polyz. Grsd. pt. ii.: Proc. Yorks. Geol. Soc. vol. xi. pt. 2, p. 263, pl. xii. figs. 2–2*b*.
,, ,, Vine, 1891. Cret. Pol.: Rep. Brit. Assoc. 1890, p. 390.
non Aulopora rugulosa, von Reuss, 1847. Foss. Polyp. Wien.: Naturw. Abh. vol. ii. p. 52, pl. vii. fig. 19.
Alecto rugulosa, von Reuss, 1854. Kreidesch. Ostalp.: Denk. Akad. Wiss. Wien. vol. vii. p. 137, pl. xxvii. fig. 13.
non ,, ,, Manzoni, 1878. Brioz. Mioc. Austr.: Denk. Akad. Wiss. Wien. vol. xxxviii. pt. 2, p. 16, pl. xv. fig. 60.
Stomatopora rugulosa, von Reuss, 1872. Bry. unt. Plän.: Palæont. vol. xx. pt. 1, p. 112, pl. xxvii. fig. 8.
Alecto incrassata, d'Orbigny, 1851. Bry. Crét. pl. 628, figs. 9–11.
Stomatopora ,, d'Orbigny, 1854. *Ibid.* p. 837.
non ,, ,, (Smitt), Hincks, 1880. Brit. Mar. Polyz. p. 436, pl. lix. figs. 2, 3.

Stomatopora regularis, Gabb & Horn, 1862. Mon. Pol.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 172, pl. xxi. fig. 63.
?*Stomatopora amphoræformis*, Hamm, 1881. Bry. Mastr. Ober-Sen. pt. i. p. 26.
,, *constricta*, Pocta, 1892. Mech. Koryc.: Ces. Akad. Fr. Jos. Praze, sect. ii. p. 12, pl. i. figs. 7, 8.
,, *variabilis*, Vine, 1892. Add. Cret. Pol.: Proc. Yorks. Geol. Soc. vol. xii. pt. 2, p. 150, pl. vi. figs. 1*a*, *b*.
,, *dixoni, pars*, Vine, 1893. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 307.

DIAGNOSIS.

Zoarium typically forming an irregular network; but in less densely growing varieties it consists of irregular, radiating tufts, the branches of which dichotomize repeatedly. Young zoaria may consist of a single line of zoœcia, and in some zoaria long, unbranched series predominate. The branches are occasionally biserial in places owing to crowding of the zoœcia.

Zoœcia usually cylindrical, but varying to subfusiform or bottle-shaped; they vary greatly in dimensions and shape. The wall is smooth, punctulate or transversely wrinkled, and it is rarely subcarinate.

Peristomes generally well raised, sometimes twice as high as the diameter of the zoœcia.

DIMENSIONS.

	M. Edwards' type. mm.	B.M. B. 112. mm.	B.M. B. 4245. mm.	Pergens. mm.	Var. *gigantea*, Pergens. mm.	Waters. mm.
Diameter of zoœcia	·3	·3	·6	·26–·5	·4–·6	·15
Length of zoœcia	·7	·8	1·2–2·3	·5–1	1·2–1·5	1
Diameter of aperture (inside measurement)	·1	·1	·12–·2	·08–·1	·12	·12

DISTRIBUTION.

BRITISH:

Upper Chalk—Zone of *Belemnitella mucronata*: Norwich.
Zone of *Actinocamax quadratus*: Highfield and East Harnham, near Salisbury.
Zone of *Micraster coranguinum*: Hitchin; Gravesend.
Hertford; Houghton, Sussex; Tong, near Sittingbourne; Bromley and Margate, Kent.
Middle Chalk—Zones of *Micraster coranguinum* and *M. cortestudinarium*: Chatham; Stoke Pit, Guildford.
Lower Chalk: St. Catherine's Hill, Guildford.
Chalk Detritus: Charing, Kent.

Upper Greensand: Warminster; Cambridge; Little Haldon.
Red Chalk: Hunstanton.

FOREIGN:

Danian: Faxoe.
Senonian—Maastrichtian: Maastricht; Falkenberg; Geulhem; Ciply; Meudon; Fécamp, near Dieppe.
Campanian: Epernay and Rheims; Rügen and Lägerdorf; New Jersey; Sudmerberg, near Goslar, Brunswick.
Santonian: Ste. Paterne, Loir-et-Cher; Cachembach and Arche de Lèves, near Chartres, Eure-et-Loir.
Turonian: Sarstedt and Peine, near Hannover; Lavardin, Villardin, St. Rimay, and Les Roches, Loir-et-Cher; La Ribochère, Indre-et-Loir; Mecklenburg; Villecien, Yonne; Gosau.
Cenomanian: Le Mans, Janières, and St. Calais, Sarthe; Cap de la Hève; Villers, Calvados; Île Madame, Charente-Inférieure; Schillinge, near Bilin, Bohemia, in Lower Pläner; Kamajk, near Caslau, and Kank, in Korycaner Schichten.
? Albian: Les Saints-en-Puisaye, Yonne.
Rhodanian: Vassy, Haute-Marne.
Neocomian: Ste. Croix, Vaud; Berklingen, Brunswick.

FIGURES.

Pl. I. Figs. 1–4, 6, 7.—Pl. I. Fig. 1, a part of a zoarium of var. *gigantea*, showing an unusually corrugated specimen, and approaching the var. *rugulosa*; × 5 dia. Upper Chalk: England. **B. 4245.**

Pl. I. Fig. 2. Two branches of a zoarium of the typical form, × 6 dia. Upper Chalk: Tong, near Sittingbourne. **B. 112.**

Pl. I. Fig. 3. Part of a zoarium of var. *rugulosa*, × 7 dia. Chalk: Stoke Pit, Guildford. **D. 5147.**

Pl. I. Fig. 4. Part of a very irregular, corrugated zoarium, × 10 dia. Upper Chalk: Bromley. **D. 2843.**

Pl. I. Fig. 6. Part of a zoarium with subpyriform zoœcia in part biserial, × 10 dia. Upper Chalk: Chatham. **D. 3788.**

Pl. I. Fig. 7. Part of a specimen in which some of the zoœcia approach the *S. calypso* (Orb.), × 10 dia. Upper Chalk: Chatham. Vine Coll. **D. 369.**

SYNONYMY AND VARIETIES.

This species was based by Milne Edwards on a specimen from the Rhodanian of Vassy, in the department of Haute-Marne. Milne Edwards gave a good figure of the specimen, and he remarked its resemblance to the Jurassic species *S. dichotoma* (Lamx.), of which it is unquestionably the Cretaceous representative. In 1847 a great alteration in the interpretation of this species was made by Johnston,[1] who placed in it a series of recent Bryozoa. Nearly all subsequent writers upon this 'species' have removed from it some of the specimens Johnston referred to it, which are really *Proboscinæ*; but it has been usual to leave some of the recent uniserial forms in the Cretaceous species. The figures given by Hincks[2] and Busk[3] may be taken to represent the recent types referred to *S. granulata*; they differ more from that 'species' than it does from *S. dichotoma*. The recent forms have the zoœcia shorter in proportion to their width; they are more punctate and less wrinkled. If the existing Cretaceous 'species' are to be united, then both must be included in *S. dichotoma*. Hence, as I have previously suggested,[4] it is convenient to separate the recent members of this group under the name of *S. trahens* (Couch).

M. Pergens, in his "Revision des Bryozoaires du Crétacé figurés par d'Orbigny,"[5] includes in *S. granulata* a series of forms described by d'Orbigny as distinct species. With most of his decisions, I fully agree. Pergens figured a specimen which showed that the transverse crumpling of the front wall of the zoœcia was a very inconstant character; and thus d'Orbigny's *Alecto subgracilis* may be abandoned. Pergens also places *S. plicata* in the list of synonyms; as he has examined d'Orbigny's type, it is evident that the oval appearance of the zoœcia in the original figure was exaggerated, or else it would have approached more nearly to *S. calypso*. With the abandonment of *S. plicata*, *S. linearis* seems to me necessarily to fall into *S. granulata*; for *S. linearis* is only a variety with zoœcia shaped like those of *S. plicata*, and occurring in long linear series owing to the rarity of branching; even in very typical specimens of *S. granulata* one branch may run for some distance without dividing.

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[1] Johnston: Brit. Zooph., 2nd ed. (1847), p. 280.

[2] Hincks: Brit. Mar. Polyz. p. 425, pl. lvii. figs. 1, 2.

[3] Busk: Brit. Mus. Cat. vol. iii. p. 24, pl. xxxii. fig. 1.

[4] Cat. Jur. Bry. p. 487.

[5] Bull. Soc. belge Géol. vol. iii. (1889), 1890, pp. 305–400, pls. xi.–xiii. This important work is hereafter referred to as "Revision." D'Orbigny's monograph, referred to as "Bry. Crét.," is vol. v. of "Paléontologie française: Terrains Crétacés"; it is dated on the title-page as issued 1850–52, but was apparently issued between 1851 and 1854. The dates of the parts and pages, as far as I have been able to verify them, will be given in the Bibliography.

Pergens also includes d'Orbigny's two species *S. incrassata* and *S. reticulata* in *S. granulata*; the dimensions given by M. Pergens for the three types are identical.

A variety was founded by Pergens for specimens with especially large zoœcia. According to his measurements the zoœcia of the typical members of *S. granulata* have an average diameter of ·37 mm. (varying from ·26 to ·48 mm.), with an aperture of ·09 mm. in diameter; the corresponding dimensions in his var. *gigantea* are ·5 mm. (varying from ·4 to ·6 mm.) and ·12 mm., while the zoœcia are from 1·2 to 1·5 mm. long. The specimen illustrated by Pl. I. Fig. 1 is therefore a large form of the *gigantea* variety, while Pl. I. Fig. 2 shows the more typical form.

A closely allied form to var. *gigantea* is the Bryozoan described by von Reuss as *S. rugulosa*. Calculated from Reuss's figures the zoœcia are ·5 mm. broad and 1·25 mm. long, and have the orifices ·15 mm. in diameter; so that the dimensions are the same as in Pergens' var. *gigantea*. The characteristic of this variety is the regularity and prominence of the transverse corrugation; in consequence of this character specimens referable to this variety have often a very crooked growth. The Miocene Bryozoan from Eisenstadt described as *Alecto rugulosa* by Manzoni is a *Proboscina*.

Vine originally described a species found in the Cambridge Greensand as *Stomatopora gracilis*; but in his description he expressly mentions that the branches of the zoarium rarely anastomosed, and that the zoœcia are thick. In his "Further Notes on the Polyzoa of the Lower Greensand and the Upper Greensand of Cambridge," he makes no mention of this species, but refers the specimens of *Stomatopora* to two species—*S. graciliformis*, Vine, and *S. linearis*, var. *mortoni*, n. var. The latter seems to be clearly the same form that Vine had previously referred to *S. gracilis*; while the former is certainly a synonym of *S. subgracilis*, d'Orb.; for the name was only proposed owing to Vine having overlooked the fact that d'Orbigny had himself renamed the form he had erroneously assigned to *S. gracilis* (Edw.). Both the Cambridge Greensand forms, therefore, belong to *S. granulata*. Vine's main reason for separating them into two species was apparently owing to difference in dimensions; but according to his own measurements in his *S. graciliformis* the zoœcia are occasionally 1 mm. in length, while in his *S. linearis*, var. *mortoni*, they are about 1·5 mm. in length; and if *S. graciliformis* were to be assigned to *S. gracilis*, then it ought to have longer instead of shorter zoœcia than *S. linearis*.

D'Orbigny separated from *S. granulata*, under the name of *S. reticulata*, the somewhat densely crowded form referred to this species by Michelin. But I quite agree with Pergens that Michelin was correct in his identification.

The brief description given by Hamm of his *Stomatopora amphoræformis* is insufficient for its certain recognition. But his description, so far as it goes, is consistent with the form belonging to *S. granulata*; zoœcia which may be described as amphoriform are shown on Pl. I. Fig. 2.

AFFINITIES.

The nearest ally of *S. granulata* is *S. dichotoma* (Lamx.) from the Bathonian, in which the zoœcia are more regularly cylindrical, the zoarium more regular, and the peristomes usually less raised. Its distinctions from the living *S. trahens* (Couch) have been already stated (p. 7). Amongst Lower Cainozoic *Stomatoporæ* it is most allied to the Eocene specimens from New Zealand which Waters assigns to this species; the dimensions, however, as given by Waters and quoted on p. 5, suggest considerable differences; the zoœcia being six times as long as broad, whereas in the Cretaceous *S. granulata* that ratio varies from 3 : 6 to 3 : 8.

The *Stomatopora minima*, Röm.,[1] from the Upper Oligocene of Söllingen, North Germany, is a very close ally of *S. granulata*; but the specimen figured by Römer is insufficient to warrant the inclusion of that Bryozoan in the Cretaceous 'species.' *S. reussi*, Greg.,[2] from the Hungarian Miocene, is a member of the *S. granulata* series, with longer and thinner zoœcia.

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[1] F. A. Römer. Polyp. Nordd. Tert. Geb.: Palæontogr. vol. ix. (1862–4), p. 220, pl. xxxviii. fig. 1.

[2] Cat. Jur. Bry. p. 55.

LIST OF SPECIMENS.

British.

B. 4245. A specimen of var. *gigantea*, Perg., encrusting fragment of *Echinocorys scutatus*. Upper Chalk. Loc. ? Old Coll. Figd. Pl. I. Fig. 1.

B. 113. With *Membranipora*, sp., encrusting fragment of *Micraster*. Upper Chalk. Tong Meadow, near Sittingbourne. T. R. Jones Coll. Figd. Pl. I. Fig. 2.

D. 5147. A specimen of var. *rugulosa* (Reuss), on fragment of echinid. Middle Chalk. Stoke Pit, Guildford. Capron Coll. Figd. Pl. I. Fig. 3.

D. 2843. An irregular form of var. *rugulosa* (Reuss). Upper Chalk. Bromley. J. Simmons Coll. Figd. Pl. I. Fig. 4.

D. 3788. A zoarium which is locally biserial, and has some subpyriform zoœcia. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. I. Fig. 6.

D. 369. A zoarium with zoœcia approximating to the form of *S. calypso*, d'Orb. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. I. Fig. 7.

D. 952. A specimen on echinid fragment. Middle Chalk. Chatham. Vine Coll. No. 3** ; identified by Vine as *S. plicata*.

D. 957. A specimen on echinid fragment. Middle Chalk. Chatham. Vine Coll. No. 3* ; identified by Vine as *S. plicata*, var.

D. 956. Another specimen. Middle Chalk. Chatham. Vine Coll. No. 3 ; identified by Vine as var. *gigantea*.

D. 366, D. 370, D. 515, D. 518. Four specimens on echinid fragments. Middle Chalk. Chatham. Gamble Coll.

D. 2859. A small zoarium. Chalk Detritus. Charing, Kent. T. R. Jones Coll., 1881.

D. 717. On fragment of *Inoceramus*, with *Proboscina*, sp., and *Berenicea papillosa* (Rss.). Middle Chalk. Chatham. Vine Coll. The specimen is identified as *S. dixoni* by Vine : Rep. Brit. Assoc. 1892, p. 307.

D. 2974. On fragment of *Inoceramus*. Lower Chalk. St. Catherine's Hill Pit, near Guildford. Capron Coll.

D. 3815. With *Proboscina fasciculata* (Rss.), var. *toucasi*, d'Orb., and *Berenicea papillosa* (Rss.), on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 3814. With *Proboscina fasciculata* (Rss.), var. *toucasi*, d'Orb., *Membranipora*, sp., and *Homalostega*, sp., on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 4174. On spine of *Cidaris clavigera*. Middle Chalk. Chatham. Gamble Coll.

D. 4355. On *Terebratula*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 4263. A specimen of var. *gigantea*, Pergens, with *Micropora*, sp., on fragment of *Echinocorys*. Middle Chalk. Chatham. Gamble Coll.

D. 4333. Upper Chalk : zone of *Actinocamax quadratus*. East Harnham. Gamble Coll.

D. 4334. With *Membranipora*, sp., on echinid plate. Upper Chalk : zone of *Belemnites quadratus*. East Harnham. Gamble Coll.

D. 4308. With *Membranipora*, sp., on *Actinocamax quadratus*. Upper Chalk. East Harnham. Gamble Coll.

D. 4315. With *Membranipora*, sp., on *Micraster coranguinum*. Upper Chalk: zone of *Actinocamax quadratus*. Highfield, near Salisbury. Gamble Coll.

D. 4297. A specimen of var. *gigantea*, Perg., on *Echinocorys scutatus*, var. *pyramidatus*. Upper Chalk: zone of *Actinocamax quadratus*. Highfield, near Salisbury. Gamble Coll.

D. 5157. Two small zoaria on a fragment of *Micraster*. Upper Chalk. Hertford. Presented by J. W. Gregory.

D. 3120. A large irregular zoarium encrusting plates of *Echinocorys scutatus*. Upper Chalk. Margate. Wetherell Coll.

D. 2940. A specimen, with '*Marginaria*' *römeri* and *Proboscina crassa* (Röm.), var. *alectodes*, Greg., encrusting *Echinocorys scutatus*. Upper Chalk. Houghton. Dixon Coll.

D. 2941. With *Epiphaxum auloporoides*. Upper Chalk. Loc.? Dixon Coll. The specimen figured by Dixon (Geol. Suss. pl. xviii. fig. 35) as *S. ramea*.

D. 4385. An irregular zoarium with many of the zooecia longer than the average of the species; encrusting *Micraster cortestudinarium*. Chalk. Base of zone of *M. coranguinum*, near Hitchin. Presented by Wm. Hill, Esq., F.G.S.

B. 4238. Encrusting fragment of *Echinocorys scutatus*. Middle Chalk. Loc.? Bowerbank Coll.

D. 3781. Encrusting fragment of *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 3782. Encrusting a *Micraster cortestudinarium*. Middle Chalk. Chatham. Gamble Coll.

D. 3783. Encrusting a *Micraster cortestudinarium*, with *Proboscina crassa* (Röm.), var. *alectodes*, Greg. Middle Chatham. Gamble Coll.

D. 3784. Encrusting *Echinocorys scutatus*, with *Proboscina ramosa* (Edw.) and *Proboscina fasciculata* (Rss.). Middle Chalk. Chatham. Gamble Coll.

D. 3796. Encrusting *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 3823. Encrusting fragment of *Inoceramus*. Middle Chalk. Chatham. Gamble Coll.

D. 3826. Encrusting fragment of *Echinocorys*, with *Proboscina ramosa* (Edw.). Middle Chalk. Chatham. Gamble Coll.

D. 3828. Seven zoaria encrusting echinid plates. Middle Chalk. Chatham. Gamble Coll.

D. 4114. Encrusting fragment of *Inoceramus*. Middle Chalk. Chatham. Gamble Coll.

D. 5148. Encrusting fragment of *Micraster*. Middle Chalk. Chatham. Gamble Coll.

D. 2978. A zoarium with *Proboscina bohemica*, Nov., var. *chathamensis* (Vine), on fragment of *Echinocorys scutatus*. Middle Chalk. Chatham. Presented by W. Gamble, Esq., 1889.

D. 2927. A specimen on *Galerites albogalerus*. Upper Chalk: zone of *M. coranguinum*. Gravesend.

B. 4238. A zoarium on fragment of *Echinocorys.* Upper Chalk. Loc.? Bowerbank Coll.

D. 497. A specimen on a spine of *Cidaris clavigera.* Middle Chalk. Chatham. Gamble Coll.

D. 495. A specimen on fragment of *Echinocorys.* Middle Chalk. Chatham. Gamble Coll.

D. 496. A specimen on fragment of *Inoceramus.* Middle Chalk. Chatham. Gamble Coll.

57,587. A specimen on fragment of echinid. Upper Chalk. Bromley. Simmons Coll.

D. 2929. A specimen on *Micraster cortestudinarium.* Middle Chalk. Loc.? Old Coll.

D. 2928. A specimen with *Proboscina,* sp., etc., on *Epiaster,* sp. Chalk. Old Coll.

D. 512. With *Berenicea papillosa* (Rss.), *Membranipora,* sp., and *Onychocella,* sp., on *Echinocorys scutatus.* Middle Chalk. Chatham. Gamble Coll.

D. 4135. A variety approaching *S. calypso.* Middle Chalk. Chatham. Gamble Coll.

D. 2970. A specimen on echinid fragment. Chalk. S.E. of England. Toulmin Smith Coll. 1869.

50,473. A specimen on echinid fragment. Chalk. Loc.? Morris Coll.

D. 2930. A specimen on *Terebratula biplicata.* Upper Greensand. Loc.? Old Coll.

24,445. A zoarium encrusting *Catopygus columbarius,* 'Junction bed' of Upper Greensand. Warminster. J. Baker Coll.

D. 2965. A worn zoarium, with *Berenicea dilatata* (Orb.), encrusting *Pharetrospongia strahani.* Upper Greensand. Cambridge. Purchased April, 1894. The type of *S. linearis,* var. *mortoni,* Vine. Figd. Proc. Yorks. Geol. Soc. vol. xi. pl. xii. figs. 1*a*, *b*.

D. 2931. On *Radiolites mortoni.* Upper Greensand. Cambridge. Jesson Coll.

D. 2932. Another specimen of the same locality, encrusting an *Ostrea.* Figd. *ibid.* fig. 1*c*. Jesson Coll.

D. 2933. Var. *rugulosa,* on *Ostrea,* sp. Upper Greensand. Cambridge. Jesson Coll.

D. 2934. On *Radiolites mortoni.* Upper Greensand. Cambridge. Jesson Coll.

D. 3149. On *Catopygus columbarius,* with *Proboscina angustata* (Orb.), etc. Upper Greensand. Isle of Wight. Old Coll.

D. 2939. On *Patellina lenticularis.* Upper Greensand. Little Haldon, S. Devon. Presented by A. Rogers, Esq.

D. 2012. On *Terebratula biplicata.* Red Chalk. Hunstanton. Referred to by Vine, No. 3: Quart. Journ. Geol. Soc. vol. xlvi. p. 465. Figd. Proc. Yorks. Geol. Soc. vol. xi. pl. xix. fig. 3. Jesson Coll.

D. 2013. On *Terebratula,* sp. Red Chalk. Hunstanton. Recorded as var. *incrassata* by Vine, No. 4: Quart. Journ. Geol. Soc. vol. xlvi. p. 465. Jesson Coll.

D. 2014. On *Terebratula biplicata.* Red Chalk. Hunstanton. Recorded as *S. ramea* by Vine, No. 5: *ibid.* p. 465. Jesson Coll.

Foreign.

D. 4884. A small zoarium of a linear series, crowded at one end (on slide). Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

? D. 4883. A broken zoarium. Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4886. A small zoarium of thick, broad zoœcia (on slide). Craie marneuse. Les Roches, Loir-et-Cher. Purchased 1898.

D. 4887. A specimen of the *subgracilis* form (on slide). Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

D. 4938. A specimen of the form *ramea* of d'Orbigny, encrusting shell fragment, with *Petalopora costata*, *Melicertites semiluna*, and '*Eschara*' *archosia*. Turonian: Craie à noyaux. Villardin, Loir-et-Cher. Purchased.

D. 3608. A small zoarium. Senonian: Tuffeau de Ciply. Ciply, Belgium. Hottalart Coll., 1852.

D. 3712. A few zoœcia, one with unusually high peristome. Quadratenkreide. Sudmerberg, Brunswick. Saemann Coll.

D. 3651. A worn specimen, encrusting *Alveolites dichotoma*. Hilsconglomerat. Berklingen, Brunswick. Saemann Coll. Identified as *Aulopora divaricata*, Röm.; but the zoœcia are much longer.

D. 4391. A zoarium with *Berenicea papillosa* (Rss.), encrusting a sponge fragment. Cenomanian. Cap de la Hève. Presented by Wm. Hill, Esq., F.G.S.

2. Stomatopora gracilis (M. Edwards), 1838.

Synonymy.

Alecto gracilis, M. Edwards, 1838. Mém. Cris.: Ann. Sci. nat., Zool., ser. 2, vol. ix. p. 207, pl. xvi. fig. 2.
non Alecto gracilis, d'Orbigny, 1851. Bry. Crét. pl. 629, figs. 1–4.
Stomatopora gracilis, Bronn, 1848. Ind. Pal., Nomencl., p. 1202.
,, ,, d'Orbigny, 1853–4. Bry. Crét. p. 843, pl. 758, figs. 17, 18.
,, ,, Hamm, 1881. Bry. Mastr. Ober-Sen. pt. i. p. 26.
,, ,, Pergens, 1890. Revision, p. 328.
non ,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlv. p. 463.
non ,, ,, var. *delicatula*, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 371, pl. xvii. fig. 1.
non ,, ,, Vine, 1891. Rep. Brit. Assoc. 1890, p. 396.
non ,, ,, Vine, 1893. Rep. Cret. Polyz.: *ibid.* 1892, p. 307.
Alecto longiscata, d'Orbigny, 1851. Bry. Crét. pl. 629, figs. 9–11.
Stomatopora longiscata, d'Orbigny, 1854. *Ibid.* p. 839.
,, ,, Boll, 1853. Mekl. dil. Kreidever.: Arch. Ver. Naturg. Meckl. vol. vii. p. 83.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 14.
,, ,, Pergens, 1890. Revision, p. 329, pl. xi. fig. 1.
,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 465.

Stomatopora longiscata, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 372, pl. xvii. fig. 4.
,, ,, Vine, 1891. Cret. Bry.: Rep. Brit. Assoc. 1890, p. 396.
,, ,, Vine, 1892. Addit. Cret.: Proc. Yorks. Geol. Soc. vol. xii. pt. 2, p. 160, pl. vi. fig. 1.
,, *ramea* (*non* Blain.), Vine, 1893. Rep. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 307.
,, *pedicellata*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 14, pl. i. fig. 1.
,, ,, Vine, 1892. Addit. Cret. Pol.: Proc. Yorks. Geol. Soc. vol. xii. pt. 2, p. 159, pl. vi. fig. 2.
,, *minuscula*, Pocta, 1892. Mech. Koryc.: Ces. Akad. Fr. Jos. Praze, sect. ii. p. 12, pl. i. figs. 5, 6.

DIAGNOSIS.

Zoarium of loose, open tufts; the branches dichotomize repeatedly, but the branches are never crowded or biserial.

Zoœcia long and narrow; sometimes cylindrical, but typically they expand gradually to the distal end, so that the shape is subpyriform. The wall is smooth and slightly corrugated, or punctulate.

Peristomes usually low, and somewhat elongate; but they may be a little raised and reflexed.

DIMENSIONS.

	M. Edwards' type.	Pergens.	B.M. 57,553.	B.M. D. 954.
Diameter of zoœcia	·12–·16 mm.	·08–·11 mm.	·3 mm.	·2 mm.
Length of zoœcia	·4 ,,	1·2 ,,	·6–1 ,,	·8 ,,
Diameter of aperture (inside measurement)	·04 ,,	—	·12 ,,	·1 ,,

DISTRIBUTION.

BRITISH:

Upper Chalk—Zone of *Belemnitella mucronata*: Norwich.
Zone of *Actinocamax quadratus*: East Harnham, near Salisbury.
Zone of *M. coranguinum*: Quidhampton, near Salisbury; Gravesend.
Middle Chalk: Chatham.
Red Chalk: Hunstanton.

FOREIGN:

Senonian—Maastrichtian: Meudon; Rügen; Maastricht, in Maastrichter Kreide (*fide* Hamm).
Turonian: Villardin, Loir-et-Cher, in Craie marneuse; Mecklenburg.
Cenomanian: Le Mans, Sarthe; Villers, Calvados; Kank, Bohemia, in Korycaner Schichten.

FIGURES.

Pl. I. Fig. 10. Part of a zoarium encrusting a *Bourgueticrinus*, × 9 dia. Upper Chalk: Gravesend. Wetherell Coll.

Pl. I. Fig. 11. Part of a zoarium encrusting and partly embedded in an echinid plate, × 10 dia. Middle Chalk: Chatham. Vine Coll.

AFFINITIES.

The relations between *S. gracilis* and *S. granulata* among Cretaceous Bryozoa are analogous to those between *S. waltoni* and *S. dichotoma* in the Jurassic series. *S. gracilis* has longer and thinner zoœcia than *S. granulata*; but the difference cannot be rigidly defined. In Milne Edwards' types of *S. granulata* and *S. gracilis* the ratio of zoœcial length to diameter is 1 : 2/2½ and 1 : 3 respectively. In most of the specimens subsequently referred to *S. gracilis* the ratio is higher, and 1 : 4 is a low average. Dimensions seem to me of far less value than is attached to them by some authors, e.g. MM. Pergens and Canu. This species illustrates the point. For, according to M. Pergens' dimensions of the specimens he includes in the 'species,' the ratio of length to diameter is four times as great as in Milne Edwards' type. I should not feel inclined to retain the 'species,' were not the differences in zoœcial dimensions accompanied by other characters; thus, in *S. gracilis* the zoarium is more open and less crowded, and the zoœcia are often subpyriform, although cylindrical in young and thin zoaria.

S. gracilis differs from *S. calypso* by having less elliptical zoœcia, and from *S. divaricata* by having longer zoœcia. It is, however, more closely related to the *Aulopora divaricata*, von Reuss,[1] from the Hungarian Leithakalk, that has been renamed as *S. reussi*,[2] which has more regularly cylindrical zoœcia, and is better regarded as a Cainozoic elongate form of *S. granulata*.

Among Cainozoic Bryozoa *S. gracilis* is probably most closely allied to the Bryozoan described by Manzoni[3] as *Ætea sica*,

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[1] Von Reuss. Foss. Polyp. Wien.: Naturw. Abh. vol. ii. (1847), p. 53, pl. vii. fig. 18.

[2] Cat. Jur. Bry. p. 55.

[3] Manzoni: "I Briozoi del Pliocene antico di Castrocaro" (Bologna, 1875), pp. 6, 41, pl. vii. fig. 69.

Couch, and *Alecto parasita*, Hell., in which, however, the zoœcia are more strongly wrinkled. The zoœcial proportions are approximately the same, though the zoarium of the Italian Pliocene form is much stouter. The '*Ætea anguina*' of Manzoni[1] may be an Upper Cainozoic representative of the extremely elongate form of *S. gracilis*.

LIST OF SPECIMENS.

British.

57,553.	On *Bourgueticrinus*. Upper Chalk. Gravesend. Wetherell Coll. Figd. Pl. I. Fig. 10.
D. 954.	Partly embedded in an echinid fragment. Middle Chalk. Chatham. Vine Coll. (Vine, No. 4: Rep. Brit. Assoc. 1892, p. 307). Figd. Pl. I. Fig. 11.
24,884.	A specimen of var. *pedicellata*, with *Membranipora*, sp., on *Galerites vulgaris*. Upper Chalk. Norwich. T. G. Bayfield Coll.
D. 3249.	With *Berenicea phlyctænosa*, Rss., on fragment of *Echinocorys scutatus*. Upper Chalk: zone of *Micraster coranguinum*. Quidhampton, near Salisbury. Presented by Dr. H. P. Blackmore, F.G.S.
D. 3247.	With *Onychocella*, sp., on fragment of *Echinocorys scutatus*. Upper Chalk: zone of *Actinocamax quadratus*. East Harnham, near Salisbury. Presented by Dr. H. P. Blackmore, F.G.S.
D. 479.	With *Berenicea papillosa* (Rss.), on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.
D. 955.	On fragment of *Echinocorys*. Middle Chalk. Chatham. Vine Coll. (*S. ramea* of Vine: Rep. Brit. Assoc. 1892, p. 307.)
D. 367.	On echinid fragment. Middle Chalk. Chatham. Gamble Coll.
D. 371.	On echinid fragment. Middle Chalk. Chatham. Gamble Coll.
D. 3785.	Encrusting *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.
D. 3786.	Encrusting fragment of *Micraster cortestudinarium*. Middle Chalk. Chatham. Gamble Coll.
D. 3787.	Encrusting fragment of *Echinocorys scutatus*, with *Proboscina sarthacensis* (Perg.). Middle Chalk. Chatham. Gamble Coll.
D. 3833.	Encrusting *Cidaris* spine. Middle Chalk. Chatham. Gamble Coll.
D. 3834.	Encrusting sponge fragment, with *Berenicea papillosa* (Rss.) and *Proboscina cornucopiæ* (Orb.). Middle Chalk. Chatham. Gamble Coll.
D. 4089.	Encrusting fragment of *Inoceramus*, sp. Middle Chalk. Chatham. Gamble Coll.
D. 3797.	Two zoœcia, encrusting fragment of *Micraster*, sp. Middle Chalk. Chatham. Gamble Coll.

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[1] Manzoni: "I Briozoi del Pliocene antico di Castrocaro" (Bologna, 1875), p. 6, pl. vii. fig. 70.

23,090. With *Onychocella*, sp., on *Galerites subrotundus*. Upper Chalk. Kent. Paul Mohr Coll.

D. 2971. With young *Berenicea disciformis* (Hag.), on fragment of *Echinocorys*. Chalk. Loc. ? Toulmin Smith Coll.

D. 2972. On echinid fragment. Chalk. Loc. ? Old Coll.

D. 2016. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Recorded as *S. longiscata*, Vine, No. 8: Quart. Journ. Geol. Soc. vol. xlvi. p. 466; and figd. Vine, 1891: Proc. Yorks. Geol. Soc. vol. xi. pl. xvii. fig. 4.

D. 2010. On *Torynocrinus manon*. Red Chalk. Hunstanton. Jesson Coll. Recorded as *S. longiscata*, var., Vine, No. 6: Quart. Journ. Geol. Soc. vol. xlvi. p. 466.

D. 2009. On *Terebratula biplicata*, with *Berenicea folium*, Novak. Red Chalk. Hunstanton. Jesson Coll. The encrustation on this specimen indicated as the *S. gracilis* of Vine (specimen No. 1*a*: Quart. Journ. Geol. Soc. vol. xlvi. p. 463; and figd as type of var. *delicatula*: Proc. Yorks. Geol. Soc. vol. xi. pl. xvii. fig. 1) is a Foraminifera.

FOREIGN.

D. 4882. A simple Y-shaped zoarium (on slide). Craie marneuse. Villardin, Loir-et-Cher. Purchased.

3. **Stomatopora divaricata** (von Römer), 1839.

SYNONYMY.

Aulopora divaricata, von Römer, 1839. Verst. nordd. Ool. Geb.: Nachtr. p. 15, pl. xvii. fig. 3.
,, ,, von Römer, 1840. Verst. nordd. Kr. Geb. p. 18.
non ,, ,, von Reuss, 1847. Foss. Polyp. Wien.: Naturw. Abh. vol. ii. p. 53, pl. vii. fig. 18.
Alecto ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 175.
Stomatopora ,, Bronn, 1848. Ind. Pal., Nomencl., p. 1201.
,, ,, d'Orbigny, 1854. Bry. Crét. p. 840.
,, ,, Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 112, pl. xxviii. figs. 1, 2.
non ,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 463.
non ,, ,, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 373, pl. xvii. fig. 6.
,, ,, Vine, 1891. Cret. Pol.: Rep. Brit. Assoc. 1890, p. 396.
Alecto brevis, d'Orbigny, 1851. Bry. Crét. pl. 629, figs. 16–18.
pars ,, *gracilis* (*non* Edw.), Lonsdale, 1850. In Dixon's Geol. Suss. p. 269, pl. xviii. A, figs. 1*a* and *b*, *non* fig. 1*c*.
Stomatopora dixoni, *pars*, Vine, 1893. Rep. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 307.

DIAGNOSIS.

Zoarium of irregular tufts, which may either branch dichotomously or give off branchlets at right angles to the main series. Occasionally the branches are locally biserial.

Zoœcia very short; subfusiform; with lightly wrinkled walls.

Peristomes low; generally elongate longitudinally.

DIMENSIONS.

	Von Römer's type.	B.M., 60,252.
Length of zoœcia ...	1x[1] ...	·8 mm.
Diameter of zoœcia ...	1x ...	·5 ,,
Diameter of aperture ...	·5x ...	·25 ,,

DISTRIBUTION.

BRITISH :

Upper Chalk: Sussex.
Middle Chalk: Chatham.

FOREIGN :

Cenomanian: Le Mans, Sarthe; Essen, Westphalia; Saxony, in Lower Pläner.
Neocomian—Hilsconglomerat: Schandelahe, Schöppenstedt.

FIGURES.

Pl. I. Fig. 5. Part of the zoarium figured by Lonsdale as *A. gracilis*, and made the type of *S. dixoni* by Vine; × 7 dia. Upper Chalk: Sussex. Dixon Coll.

AFFINITIES.

This species is characterized by its very short, crowded zoœcia; the Upper Cretaceous specimens have longer zoœcia than the typical Neocomian form, and the specimen identified by von Reuss presents some resemblance to *S. calypso* (Orb.). The Upper Cretaceous forms may be only varieties of *S. granulata*, and it is with some hesitation that I accept the distinction.

The type of Lonsdale's *Alecto gracilis* and of Vine's *S. dixoni* is an example of the Upper Cretaceous variety; the specimen, however, identified by Vine as *S. dixoni* (Rep. Brit. Assoc. 1892, p. 307, No. 1), which is now in the British Museum collection (No. D. 717), is an *S. granulata* of the long-branched type. The specimen marked by Vine as that which he identifies as

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[1] *x* is used in cases where only comparative dimensions are available.

S. divaricata is really a Foraminifera, probably a species of *Webbina.* The specimen is very much worn, but the oval chambers look something like the zoœcia of a pyriform *Stomatopora.* The figures in the Proc. Yorks. Geol. Soc. (vol. xi. pl. xvii. fig. 6) is purely diagrammatic.

LIST OF SPECIMENS.

60,252. With *Proboscina crassa* (Röm.), var. *francorum* (Perg.), on *Micraster cortestudinarium* (Goldf.). Upper Chalk. Dixon Coll. Figd. Dixon, Geol. Suss. pl. xviii. A, figs. 1, 1*a*, 1*b* (*non* 1*c*), as *Alecto gracilis.* The specimen is also the type of *S. dixoni*, Vine. Figd. Pl. I. Fig. 5.

D. 490. Another specimen of the Upper Cretaceous variety. Middle Chalk. Chatham. Gamble Coll.

D. 2011. The specimen described and figured by Vine as representing this species in the Red Chalk is a Foraminifera, which Prof. T. Rupert Jones, F.R.S., has kindly identified as a *Webbina.* Specimen No. 2: Quart. Journ. Geol. Soc. vol. xlvi. p. 464.

4. Stomatopora calypso (d'Orbigny), 1850.

SYNONYMY.

Alecto calypso, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 630, figs. 5–8.
Stomatopora calypso, d'Orbigny, 1851. *Ibid.* p. 841.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 14.
,, ,, Pergens, 1890. Revision, p. 330.
,, *linearis*, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 466.
,, ,, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 373, pl. xvii. fig. 5.

DIAGNOSIS.

Zoarium usually crowded and reticular, formed of short, wide branches, which subdivide repeatedly; but sometimes the series are long and unbranched.

Zoœcia very short; oval in shape.

Peristomes well raised. The walls are marked by a series of from two to twelve regular, parallel, transverse folds.

DIMENSIONS.

	B.M., D. 953.	B.M., D. 2015.
Length of zoœcia	·9 mm.	1 mm.
Diameter of zoœcia	·5 ,,	·5 ,,
Diameter of aperture	·2 ,,	·15 ,,

DISTRIBUTION.

BRITISH:
Middle Chalk: Chatham.
Red Chalk: Hunstanton.

FOREIGN:
Senonian: Saintes, Charente-Inférieure.

FIGURES.

Pl. I. Fig. 8. Part of a zoarium, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 953.**

Pl. I. Fig. 9. Part of a zoarium encrusting *Terebratula biplicata*, × 10 dia. It was figured by Vine as *S. linearis* in Proc. Yorks. Geol. Soc. vol. xi. pl. xvii. fig. 5. Red Chalk: Hunstanton. Jesson Coll. **D. 2015.**

AFFINITIES.

The elliptical and almost Cheilostomatous shape of the zoœcia in this 'species' is its main character. Its nearest ally is probably *S. granulata*, from which it cannot be very sharply defined, for the specimen figured on Pl. I. Fig. 7 is in the main a normal *granulata*; but the zoœcia shown on the right-hand branch of that figure are very similar to those of *S. calypso*. I accept the species mainly owing to its retention by Pergens, and owing to the interest of the unusual zoœcial form of its zoœcia.

LIST OF SPECIMENS.

D. 953. On echinid fragment. Middle Chalk. Chatham. Vine Coll. The *S. plicata*, var. *typica*, Vine. Figd. Pl. I. Fig. 8.

D. 2015. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Recorded as *S. linearis*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 466. Figd. by Vine, 1891, Proc. Yorks. Geol. Soc. vol. xi. pl. xvii. fig. 5, and Pl. I. Fig. 9.

5. Stomatopora spicea,[1] nov.

DIAGNOSIS.

Zoarium very irregular; the branches meet to form a network. Walls strongly corrugated.

Zoœcia with very tall peristomes, raised almost at right angles to the zoarium.

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[1] *Spiceus*, 'spiky,' from spike-like prominence of the peristomes.

DIMENSIONS.

Length of an average zoœcium ...	·75 mm.
Diameter of the same	·2 ,,
Length of peristome of the same ...	·4 ,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURES.

Pl. I. Figs. 12*a*, *b*. The type-specimen from the above (Fig. 12*a*) and from the side; × 18 dia. Gamble Coll. **D. 3831.**

AFFINITIES.

The specimen on which this 'species' is founded apparently grew on the sea-floor, or attached to some soft organism; for it is now unattached, and shows no signs of having been fixed to any hard surface. The specimen is possibly only a form of *S. granulata* (Edw.), which lived on the sea-floor, half buried in ooze, so that great elongation of the peristomes became necessary. One or two of the zoœcia show the amphora-like form often met with in *S. granulata*. Nevertheless, the specimen is so different from that common 'species' that in the absence of intermediate forms it seems inadvisable to unite them.

D. 3831. A specimen (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. I. Fig. 12.

PROBOSCINA, Audouin, 1826.

SYNONYMS.

Stomatopora, pars, Hincks, Pergens, etc.
Reptotubigera, d'Orbigny, Pergens, etc.
Diastopora, pars, d'Orbigny, Lonsdale, etc.
Phalangella, Hamm (*non* Gray).
Tubulipora, pars, d'Orbigny, Vine, etc.
Alecto, pars, Manzoni, etc.
Idmonea, pars, d'Orbigny.

DIAGNOSIS.

Diastoporidæ in which the zoarium consists of multiserial, elongate bands, which may be simple or branched, and are always flat and adnate. The zoœcia are cylindrical, and narrow. The peristomes are flush with the surface of the zoarium, or slightly raised; and they are usually distributed irregularly, but are occasionally quincuncial or in transverse linear series.

TYPE SPECIES.

P. boryi, Audouin.

AFFINITIES.

The reasons for the retention of this group have been given in the Cat. Jur. Bry. The decision has been approved by some students of the Bryozoa and censured by others. The great practical convenience of the adoption of this division of Tubuliporidæ seems to outweigh the criticisms made against its validity.

The genus is very common in the Cretaceous, and is represented by a great variety of forms. Some species, e.g. *P. angustata* and *P. hagenowi*, are Stomatoporiform; some, e.g. *P. dilatata* and *P. cornucopiæ*, are Bereniciform; others, such as *P. radiolitorum* and *P. anomala*, are Idmoniiform; others again, such as *P. alternata*, are Tubuliporiform.

The Cretaceous members of the genus not only include a wide range of variations, but each member of the series is so variable that it is probably impossible to divide them into rigidly defined species. Many students of the Bryozoa have referred to the difficulty presented by this group. Thus, Hincks[1] remarks: "it is extremely difficult in this tribe to find valid specific distinctions." There is no agreement as to the most useful taxonomic character in this genus; hence the divisions here accepted are to be regarded as convenient 'circuli' of individuals, rather than as sharply defined natural 'species.'

1. **Proboscina angustata** (d'Orbigny), 1851.

SYNONYMY.

Idmonea angustata, d'Orbigny, 1851. Bry. Crét. pl. 632, figs. 7–9.
Proboscina ,, d'Orbigny, 1854. *Ibid.* p. 852.
,, ,, Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 113, pl. xxviii. fig. 34.

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[1] Hincks: Brit. Mar. Polyz. vol. i. p. 431.

Proboscina angustata, Stoliczka, 1873. Pal. Ind.: Cret. Fauna S. Ind. vol. iv. pt. 2, p. 31, pl. iii. figs. 7, 8.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 14.
? ,, ,, Vine, 1890. Greensd. Polyz.: Proc. Yorks. Geol. Soc. vol. xi. p. 265.
non ,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 467, pl. xix. fig. 1.
Stomatopora ,, Pergens, 1890. Revision, p. 331.
,, ,, Pergens, 1895. Bry. Cachemb.: Bull. Soc. belge Géol. vol. viii. p. 181.
,, ,, Canu, 1898. Bry. St. Cal.: Bull. Soc. géol. France, ser. 3, vol. xxv. p. 742.
Diastopora (*Idmonea*) *angustata*, Boll, 1853. Mekl. dil. Kreidever.: Arch. Ver. Naturg. Meckl. vol. vii. p. 83.
Idmonea rugosa, d'Orbigny, 1851. Bry. Crét. pl. 633, figs. 4–7.
Proboscina ,, d'Orbigny, 1854. *Ibid.* p. 853.
? ,, ,, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 375.
? ,, ,, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 328.
? ,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 468.
non ,, *angustata*, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 375.
,, ,, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 328.
,, *intermedia*, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 102, pl. v. figs. 1–13.
Stomatopora ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 13, pl. i. fig. 24.

Diagnosis.

Zoarium of long narrow branches, which usually subdivide dichotomously; the branches rarely anastomose. The branches consist at first of a single series of zoœcia; but sometimes after the third zoœcion the branches are biserial; nearer the ends of the branches they may be triserial, while in places four zoœcia may be crowded into a single width. The width of the branches is fairly uniform. Zoœcia long, and generally somewhat sinuous. The separate zoœcia are sharply marked off from one another, and they are visible throughout their length. The walls of the zoæcia are granulate, and sometimes marked by faint transverse corrugations or striations.

Peristomes well raised.

Gonœcium simple, clavate, with minute aperture (*fide* Pocta).

Dimensions.

	Pergens.	B.M., 50,470.
Average width of a branch	—	·5 mm.
Length of zoœcia	·3–·4 mm.	·7 ,, (·6–·9)
Diameter of zoœcia	·12–·15 ,,	·2 ,,
Diameter of aperture	·03–·04 ,,	·1 ,,

Distribution.

British:

Upper Chalk: Bromley; Margate.
Middle Chalk: Chatham.
Upper Greensand: Isle of Wight.
? Red Chalk: Hunstanton.

Foreign:

Senonian—Campanian: Rügen; ? Mecklenburg (from Drift).
Santonian: Cachembach, near Chartres.
Turonian: St. Rimay, Loir-et-Cher.
Arrialoor Series: Poodoopolliam, S. India.
Cenomanian: Le Mans and St. Calais, Sarthe; Kank, Jiné, and Kamajk, in Korycaner Schichten, and Bezdekau, near Raudnitz, in Teplitzer Schichten; Saxony, in Lower Pläner.

Figures.

Pl. II. Fig. 1. A zoarium encrusting an echinid fragment, × 7 dia. Upper Chalk: England. 50,470.

Affinities.

This group of *Proboscinæ* includes a series of specimens with long, narrow branches, which are generally biserial or triserial. D'Orbigny divided it into two species, calling the biserial forms *P. angustata* and the triserial forms *P. rugosa.* But as Pergens has pointed out, one branch of the type-specimen of P. *rugosa* is only biserial, so that the distinction is of little value; and I accordingly follow Pergens in uniting them. In consequence of this decision Novak's *P. intermedia* must enter the same specific group. Novak remarks the close resemblance of his specimens to *P. angustata*; but he separated them by three characters, the smaller diameter, smooth surface, and biserial zoarium of *P. angustata.* But Pergens' measurements of d'Orbigny's types show that the supposed difference in size does not hold; moreover, he tells us that the surface is "sometimes transversely striate," so that the second point is useless.

And the third character is invalidated by the inclusion of some triserial specimens in *P. angustata*.

Vine has figured a specimen from the Red Chalk of Hunstanton, which he refers to this species; but the specimen (B.M., encrustation on **D. 2009**) is indeterminable. The record of *P. rugosa*, from the Red Chalk of Hunstanton, by Vine, is also based on an indeterminable specimen. B.M., **D. 2017**.

Stoliczka has described a specimen from the Arrialoor Series of Southern India, which has stouter zoœcia than the European forms, but which otherwise corresponds with this species.

The nearest Jurassic ally of this species is a regular form of *P. desoudini* (Haime), figured in Cat. Jur. Bry., Pl. II. Fig. 3, which has subclavate branches with the zoœcia more crowded at the distal ends; the zoarium is more regular than in Haime's type of *P. desoudini*.

Among Cainozoic *Proboscinæ* this species is perhaps nearest to *P. trifaria* (Röm.),[1] from the German Oligocene, which appears to have coarser and stouter zoœcia, with the peristomes often more crowded together than in the Cretaceous species. Manzoni has figured as "*Alecto repens*, Wood," a triserial zoarium with very long annulated zoœcia, which presents far closer resemblance to this species than does Busk's[2] type, for it has short and crowded zoœcia.

Proboscina major (Johnst.),[3] with its biserial-triserial zoarium, is the living 'species' most resembling *P. angustata* (Orb.); but according to Hincks' figures the zoœcia are ·8 mm. in diameter, and are thus much larger than in the Cretaceous specimens.

LIST OF SPECIMENS.

British.

50,470. A zoarium encrusting an echinid fragment. Upper Chalk. England. J. Morris Coll. Figd. Pl. II. Fig. 1.

50,464. A zoarium encrusting an echinid plate (on slide). Chalk. Loc.? J. Morris Coll.

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[1] *Tubulipora trifaria*, von Römer, 1863. Polyp. nordd. Tert.: Palæontogr. vol. ix. p. 220, pl. xxxvii. fig. 2.

[2] Busk: Crag. Polyz. p. 112, pl. xx. figs. 5, 8.

[3] *Alecto major*, Johnston: Brit. Zooph., 2nd ed. (1847), vol. i. p. 281, pl. xlix. figs. 3, 4.

D. 3825. A zoarium on an echinid plate (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3837. A zoarium encrusting an echinid plate, with *Berenicea regularis* (Orb.), var. *gamblei*, Greg. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2284. With *Onychocella*, sp., on *Galerites albogalerus*. Upper Chalk. Margate. Presented by A. Hinton, Esq., F.G.S.

57,585. On *Echinocorys scutatus*, with *Membranipora*, sp. Upper Chalk. Bromley. J. Simmons Coll.

D. 3149. With *Stomatopora granulata* (Edw.), etc., on *Catopygus columbarius* (Lam.). Upper Greensand. Isle of Wight.

D. 3795. Encrusting *Micraster cortestudinarium*. Middle Chalk. Chatham. Gamble Coll.

D. 2009. With *Berenicea folium*, Novak, on *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Vine's type: Quart. Journ. Geol. Soc. vol. xlvi. pl. xix. fig. 1. The encrustation on which the figure is based is indeterminable, and is probably a Foraminifera. The specimen is No. 1*b* of Vine, whose figure is diagrammatic.

D. 2017. On *Terebratula*, sp. Red Chalk. Hunstanton. Jesson Coll. Specimen recorded as *P. rugosa* by Vine, *op. cit.* p. 468, No. 9*a*. The specimen is very badly preserved and cannot be specifically determined with certainty.

D. 2020. On *Inoceramus*, sp. Red Chalk. Hunstanton. Jesson Coll. Recorded as *P. rugosa* ? by Vine, *op. cit.* p. 468, No. 11*b*. The specimen is generically indeterminable.

FOREIGN.

D. 4881. A small unbranched, triserial, crowded zoarium (on slide). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

2. **Proboscina ramosa** (M. Edwards), 1838.

SYNONYMY.

? *Alecto ramea*, Blainville, 1834. Man. Act. p. 464, pl. lxxviii. fig. 6.
,, *ramosa*, M. Edwards, 1838. Mém. Cris.: Ann. Sci. nat., Zool., ser. 2, vol. ix. p. 207, pl. xvi. fig. 1.
,, ,, Morris, 1843. Cat. Brit. Foss. p. 30.
non ,, *ramea*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, Morris, 1854. Cat. Brit. Foss., 2nd ed., p. 119.
non Aulopora ramosa, von Hagenow, 1839. Mon. Rüg.: Neu. Jahrb. 1839, p. 291.
non ,, ,, von Römer, 1840. Verst. nordd. Kr. p. 18, pl. v. fig. 15.
non Diastopora ,, Michelin, 1845. Icon. Zooph. p. 203, pl. lii. fig. 3.
non ,, ,, Lonsdale, 1850. In Dixon's Geol. Suss. p. 295, pl. xviii. B, figs. 1–1*b*.
Stomatopora ramea, Bronn, 1848. Ind. Pal., Nomencl., p. 1202.
non ,, ,, d'Orbigny, 1851–4. Bry. Crét. p. 842, pl. 630, figs. 9–12.
? ,, ,, Staring, 1860. Bodem Nederl. vol. ii. p. 402.

? *Stomatopora ramosa,* Vine, 1884. Rep. Brit. Assoc. 1883. p. 163.
,, ,, Pergens, 1890. Revision, p. 328.
non Proboscina ramosa ?, Vine, 1889. Greensd. Pol. pt. ii.: Proc. Yorks. Geol. Soc. vol. xi. p. 264, pl. xii. figs. 5–8.
non ,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 473.
non ,, ,, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 377.
Proboscina ,, *pars,* Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, pp. 307, 329.
Diastopora, sp., Lonsdale, 1850. In Dixon's Geol. Suss. p. 273, pl. xviii. A, figs. 3, 3*a*.
Diastopora wetherelli, Morris, 1854. Cat. Brit. Foss., 2nd ed., p. 122.
,, ,, Lonsdale, 1878. In Dixon's Geol. Suss., 2nd ed., p. 320, pl. xviii. A, figs. 3, 3*a*.
Proboscina ,, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 329 (*non* No. 8, p. 307).

Diagnosis.

Zoarium of delicate branches, which are at first uniserial, but expand gradually into tufts, which may be united by lateral outgrowths.

Zoœcia long and narrow, expanding gradually to the distal end. Smooth, punctulate, or faintly corrugated.

Peristomes slightly raised.

Dimensions.

	M. Edwards' type.		B.M. D. 2975.
Length of zoœcia ...	·8–1·2 mm.	...	·7–1·2 mm.
Diameter of zoœcia ...	·25–·3 ,,	...	·2 ,,
Diameter of aperture	·08–·12 ,,	...	·08–·1 ,,

Distribution.

British:

Upper Chalk: Charlton, Kent; Hertford; Sussex.
Zone of *Belemnitella mucronata*: Clarendon, near Salisbury.
Middle Chalk: Chatham.

Foreign:

Senonian—Maastrichtian: Meudon.

Figure.

Pl. II. Fig. 2. Part of a zoarium encrusting *Galerites albogalerus*, × 11 dia. Upper Chalk: Kent. Bowerbank Coll. **D. 2975.**

AFFINITIES.

This species is here accepted for *Proboscinæ* which have zoœcia similar to those of *S. gracilis*, but have a crowded zoarium with the ends of the branches collected into fan-shaped tufts.

The first difficulty in the treatment of this 'species' is the question whether M. Edwards used the name for the same form as did his predecessor de Blainville. This is very doubtful. De Blainville's figure was very diagrammatic and imperfect; but so far as its evidence goes, it was apparently intended to represent the form for which M. Edwards founded the 'species' *Stomatopora gracilis.* However, it would only lead to confusion to invert the names from their accepted use, and thus it seems most convenient to regard Milne Edwards as the founder of both 'species,' dismissing the figure of the earlier author as indeterminable. This course is the more reasonable since de Blainville gave no diagnosis of his *Alecto ramea.*

The species is closely allied to *P. angustata*, but differs from it by the multiserial ends of the branches. In the specimen figured on Pl. II. Fig. 2, the tufted ends of the zoarium include as many as six zoœcia in a single width. But the younger part of the colony is barely distinguishable from *P. angustata.*

Another close ally is *P. hagenowi* (Rss.), which differs by the extreme irregularity of the zoarium; its branches are at first uniserial, become irregularly multiserial, and then may contract again into biserial or uniserial branches.

LIST OF SPECIMENS.

D. 2975. On *Galerites albogalerus.* Upper Chalk. Kent. Bowerbank Coll. Figd. Pl. II. Fig. 2.

D. 2941. With *Stomatopora granulata* and *Epiphaxum auloporoides,* Lonsd., on *Micraster coranguinum.* Upper Chalk. Sussex. Dixon Coll. The type of *Diastopora wetherelli,* Lonsdale, in Dixon's Geol. Suss. p. 320, pl. xviii. fig. 35; pl. xviii. A, figs. 3, 3*a*. A badly preserved young specimen, with very slender zoœcia.

D. 3246. Encrusting fragment of *Echinocorys* (on slide). Upper part of the zone of *Belemnitella mucronata.* Upper Chalk. Clarendon, near Salisbury. Presented by Dr. H. P. Blackmore, F.G.S.

D. 4370. Encrusting an echinid fragment (on slide). Upper Chalk. Charlton. Presented by G. C. Crick, Esq., F.G.S.

D. 3855. Encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 364. Encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 368. Encrusting *Terebratula*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3854. Encrusting an echinid plate (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4372. Encrusting a fragment of *Echinocorys* (on slide). Upper Chalk. Charlton. Presented by G. C. Crick, Esq., F.G.S.

D. 4371, D. 4369. Encrusting echinid fragments (on slides). Upper Chalk. Charlton. Presented by G. C. Crick, Esq., F.G.S.

D. 5791. A forked zoarium on a fragment of *Inoceramus*. Upper Chalk. Hertford. Presented by J. W. Gregory.

3. Proboscina fasciculata (Reuss), 1846.

SYNONYMY.

Diastopora fasciculata, Reuss, 1846. Verst. böhm. Kr. p. 66, pl. xv. figs. 35–7.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
,, ,, *pars*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
non Idmonea ,, d'Orbigny, 1851. Bry. Crét. pl. 634, figs. 10–13.
Proboscina ,, *pars*, d'Orbigny, 1854. *Ibid.* p. 857.
? ,, ,, Staring, 1860. Bodem Nederl. vol. ii. p. 402.
non Stomatopora fasciculata, Hincks, 1880. Brit. Mar. Pol. p. 441, pl. lix. fig. 45.
Stomatopora fasciculata, Pergens, 1890. Revision, p. 331.
Diastopora ramosa (*non* Edw.), Lonsdale, 1850. Dixon's Geol. Suss. p. 295, pl. xviii. B, fig. 1.
Proboscina ,, *pars*, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 307 (*non* p. 329).
Idmonea toucasiana, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 634, figs. 5, 6.
Proboscina ,, d'Orbigny, 1854. *Ibid.* p. 856.
,, ,, Bucaille, 1890. Bry. Crét. Seine Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. pp. 507, 510.
,, ,, Peron, 1888. Craie Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. p. 225.
,, ,, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 328.
? ,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 473.
? ,, ,, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 377.
Stomatopora ,, Pergens, 1890. Revision, p. 331, pl. xi. fig. 8.
,, ,, Pergens, 1894. Bry. Cachemb.: *ibid.* vol. viii. p. 182.
Idmonea elegans, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 634, figs. 1–4.
Proboscina ,, d'Orbigny, 1854. *Ibid.* p. 856.
Idmonea ziczac, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 631, figs. 6–8.
Proboscina ,, d'Orbigny, 1854. *Ibid.* p. 847.
Stomatopora disjecta, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 13, pl. i. fig. 19.
Proboscina wetherelli, Vine, 1893, Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 307, No. 8.

DIAGNOSIS.

Zoarium of irregular, multiserial branches, which are long and narrow, and expand slowly. The branches are never very wide. In the typical form they are nodulose; or in var. *toucasi* they occur as irregular bands. The branches are usually free laterally; but in crowded specimens they may overlap and anastomose.

Zoœcia long, narrow, and well-marked off from one another. The walls are plain.

Apertures small and irregularly distributed. Peristomes low.

DIMENSIONS.

	Pocta's *S. disjecta.*	D'Orb. type of var. *toucasi* (*fide* Pergens).	B.M. D. 2669.	B.M. D. 3813.
Length of zoœcia	—	·5–·7 mm.	·8 mm.	·4–·8 mm.
Diameter of zoœcia	·13–·15 mm.	·12–·15 ,,	·18 ,,	·15 ,,
Diameter of aperture	·09–·1 ,,	·05–·06 ,,	·1 ,,	·08 ,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Houghton, Sussex.
Middle Chalk: Chatham.
? Red Chalk: Hunstanton.

FOREIGN:

Senonian — Maastrichtian: Meudon, near Paris; Fécamp, Seine Inférieure.
Campanian—Zones of *Micraster fastigiatus* and *M. glyphus*: Reims and Epernay.
Santonian: Cachembach, near Chartres.
Coniacian: Tours, Marne, and Joué, Indre-et-Loire.
Turonian: Villavard, Loir-et-Cher; Merpins, Charente; Cas, near Beausset, Var.
Cenomanian: Le Mans, Sarthe; Schillinge, near Bilin, Bohemia, in Lower Pläner; Kauk, Bohemia, in Korycaner Schichten.
Rhodanian: Vassy, Haute-Marne.
Neocomian: St. Croix, Vaud. (Var. *ziczac.*)

FIGURES.

Pl. III. Fig. 2. Part of a zoarium of var. *toucasi*, nat. size (Fig. 2*a*), and × 14 dia. (Fig. 2*b*). Middle Chalk: Chatham. Gamble Coll. **D. 466.**

Pl. III. Fig. 3. Part of a zoarium of var. *toucasi*, with narrower branches; × 16 dia. Middle Chalk: Chatham. Gamble Coll. **D. 2669.**

Pl. III. Fig. 4. Part of a zoarium of var. *toucasi*, × 8 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3813.**

AFFINITIES.

The main characters of this species are its narrow, irregular width, the repeated bifurcation of its branches, its long, narrow zoœcia, and its irregularly arranged apertures. In some specimens, as in von Reuss's type and Pocta's *Stomatopora disjecta*, the zoarium is nodulose and subclavate.

The species is represented by three main varieties: the typical Cenomanian form, in which the zoarium is nodulose; the var. *ziczac*, from the Neocomian, which I only know from the fragment figured by d'Orbigny; and the common Senonian var. *toucasi*, in which the zoarium is usually reticular, and formed of bands which vary irregularly in width. Of the three figures given by von Reuss of the typical Bohemian form, two are insufficiently magnified to show more than the zoarial characters.

Among the nearest Cretaceous allies of *P. fasciculata* is *P. angustata* (Orb.), in which the zoarium is more narrow and regular, and the zoœcia finer. It is also near to *P. ramosa* (Edw.), in which the branches become wider, expand more regularly, and anastomose less frequently. *P. sarthacensis* (Perg.) and *P. cornucopiæ* (Orb.) have more crowded zoœcia; and it differs from *P. radiolitorum* (Orb.), which parts of the zoœcia sometimes simulate, by the greater irregularity in distribution of the apertures.

In the Cat. Jur. Bry., p. 63, it was suggested that *P. toucasi* (Orb.) should include the *D. ramosa*, Mich.; but after more careful examination of the considerable series of specimens of the *toucasi* form in the collection, this proposal seems doubtful. The *D. ramosa* of Michelin, though not well figured, appears to have the zoœcia more crowded than in *P. toucasi*, one of d'Orbigny's types of which has been refigured by Pergens.

LIST OF SPECIMENS.

D. 466. A zoarium of var. *toucasi* on fragment of *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. III. Fig. 2.

D. 2669. A zoarium of var. *toucasi* on a fragment of *Inoceramus*, sp. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. III. Fig. 3.

D. 3813. A zoarium of var. *toucasi* on a fragment of *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. III. Fig. 4.

D. 475, D. 476. Two specimens of var. *toucasi*, Orb., on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 477. Specimen on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll. One branch very closely resembles the type of *P. fasciculata* (Rss.).

D. 2977. A zoarium of var. *toucasi* on fragment of *Echinocorys*. Upper Chalk. Loc.? Old Coll. Part of the zoarium is corrugated and part is plain.

D. 3868. Encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3809. A zoarium of var. *toucasi*, encrusting an echinid fragment with *Stomatopora granulata* (Edw.), on slide. Middle Chalk. Chatham. Gamble Coll.

D. 2668. A zoarium of var. *toucasi*, encrusting an echinid fragment with *Micropora*, sp. (on slide). Middle Chalk. Chatham. Vine Coll.

D. 426. A zoarium of var. *toucasi*, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3866. A small zoarium on an echinid plate, with *Proboscina bohemica*, Nov., and *Micropora*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2685. A zoarium of var. *toucasi*, encrusting an echinid fragment with *Cribrilina*, sp. (on slide). Middle Chalk. Chatham. Vine Coll.

D. 362. Var. *toucasi*, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 478. Encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 1007. A zoarium of var. *toucasi* (Orb.), encrusting *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Proboscina wetherelli* by Vine.

D. 2942. Encrusting a broken *Micraster*. Upper Chalk. Houghton, Sussex. Figured by Lonsdale as *Diastopora ramosa*, Mich. Dixon's Geol. Suss. pl. xviii. B, fig. 1.

D. 3862. A thin specimen on a fragment of *Echinocorys*, with dense growth of *Proboscina bohemica*, Nov., var. *chathamensis* (Vine). Middle Chalk. Chatham. Gamble Coll.

D. 3863. A young zoarium on echinid fragment. Middle Chalk. Chatham. Gamble Coll.

D. 3810. Zoaria of var. *toucasi* (Orb.), encrusting part of an *Echinocorys*. Middle Chalk. Chatham. Gamble Coll.

D. 3811. Zoaria of var. *toucasi* (Orb.), encrusting a young *Echinocorys scutatus* with *Membranipora*, sp., etc. Middle Chalk. Chatham. Gamble Coll.

D. 3812. Three young zoaria of var. *toucasi* (Orb.), encrusting a broken *Echinocorys*. Middle Chalk. Chatham. Gamble Coll.

D. 3839. A zoarium of var. *toucasi* (Orb.), encrusting a broken *Echinocorys* with *Berenicea papillosa* (Rss.), etc. Middle Chalk. Chatham. Gamble Coll.

D. 3846. Zoarium of var. *toucasi* (Orb.), encrusting *Echinicorys scutatus* with *Proboscina crassa* (Röm.), var. *francorum*, *Micropora*, etc. Middle Chalk. Chatham. Gamble Coll.

D. 3865. Six zoaria of var. *toucasi* (Orb.), encrusting fragments of *Echinocorys*. Middle Chalk. Chatham. Gamble Coll.

D. 4155. A young zoarium of var. *toucasi* (Orb.), encrusting an echinid plate. Middle Chalk. Chatham. Gamble Coll.

D. 4200. A crowded series of var. *toucasi* (Orb.), encrusting *Echinocorys scutatus* with *Proboscina crassa* (Röm.), var. *francorum*. Middle Chalk. Chatham. Gamble Coll.

D. 381. With *Membranipora*, sp., on fragments of echinid. Middle Chalk. Chatham. Gamble Coll.

D. 3815. With *Stomatopora granulata* (Edw.) and *Berenicea papillosa* (Rss.), on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 3838. With *Membranipora*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 3814. With *Stomatopora granulata* (Edw.), *Membranipora*, sp., *Homalostega*, sp., etc. Middle Chalk. Chatham. Gamble Coll.

? **D. 2038.** With *Berenicea regularis* (Orb.), on *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Recorded by Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 473, specimen No. 28B. The specific determination is doubtful, the colony being young and imperfect.

? **D. 2029.** On worm-tube. Red Chalk. Hunstanton. Jesson Coll., No. 19. Recorded by Vine as *Proboscina toucasiana*, *op. cit.* p. 473; but the specimen is indeterminable.

4. **Proboscina crassa** (Römer), 1839.

SYNONYMY. (*Vide* under varieties.)

DIAGNOSIS.

Zoarium partly uniserial and Stomatoporiform; partly biserial and multiserial.

Zoœcia short and stout. Cylindrical or subfusiform. Walls usually strongly wrinkled.

Peristomes well developed; strongly raised in one variety.

AFFINITIES.

This species is characterized by its apparent combination of the characters of *Stomatopora*, *Proboscina*, and *Berenicea*. The zoarium begins in the condition of the first-named, and isolated parts of it might be indistinguishable from the last. But the general character of the multiserial parts of the zoarium are distinctly those of *Proboscina*.

It represents in the Cretaceous the type of *Proboscina*, which *P. rigauxi* (Sauv.) represents in the Jurassic,[1] for both have short, strongly corrugated zoœcia, which are grouped as broad tufts. *P. cunningtoni* also resembles this species, and represents the *divaricata* type.[2] The 'species' is important, because it may be regarded as the simplest form of a series of *Proboscinæ*, differing from the three previous 'species' owing to the greater thickness and shorter length of the zoœcia. The three 'species' *P. angustata*, *P. ramosa*, and *P. fasciculata* have long narrow zoœcia like those of *Stomatopora gracilis*; *P. crassa* and its allies have shorter, stouter zoœcia like those of *S. granulata.*

Proboscina crassa was founded on a Neocomian specimen; but the species ranged from that age onward to the Senonian. It is very variable, and the grouping of the specimens referred to the 'species' is facilitated by its subdivision into five varieties—

P. crassa (Röm.), var. *a.* typical form.
b. divaricata (Orb.).
c. francorum (Perg.).
d. alectodes nov.
e. elevata, nov.

a. **Proboscina crassa,** var. **typica.**

SYNONYMY.

Aulopora ? crassa, von Römer, 1839. Verst. nordd. Ool., Nachtr. p. 15, pl. xvii. fig. 5.
,, ,, Römer, 1840. Verst. nordd. Kr. p. 18.
? *Idmonea* ,, *pars,* d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
Proboscina ,, *pars,* d'Orbigny, 1854. Bry. Crét. p. 848.

VARIETAL CHARACTERS.

Zoarium crowded, biserial or multiserial, with uniserial offshoots. Peristomes not much elevated.

DISTRIBUTION.

Neocomian—Hilsthon: Schandelahe.
Hilsconglomerat: Schoppenstedt.

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[1] Cat. Jur. Bry. p. 69, pl. ii. fig. 6.

[2] *Ibid.* p. 67, pl. ii. fig. 4.

b. **Proboscina crassa** (Röm.), var. **divaricata** (d'Orbigny).

SYNONYMY.

Idmonea divaricata, *pars*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
,, ,, (*non* Röm.), d'Orbigny, 1851. Bry. Crét. pl. 631, figs. 9–11.
non Stomatopora divaricata, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 11, pl. i. figs. 1–4.
Idmonea crassa, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
Proboscina crassa, d'Orbigny, 1854. Bry. Crét. p. 848.
,, ,, Pergens, 1890. Revision, p. 338.
? *Proboscina marginata* (*non* Orb.), Sharpe, 1854. Age Farringd.: Quart. Journ. Geol. Soc. vol. x. p. 191.
? ,, ,, Morris, 1854. Cat. Brit. Foss., 2nd ed., p. 127.
,, ,, *pars*, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 329.

VARIETAL CHARACTERS.

Zoarium of dichotomous branches, which may be very crowded. The branches are seldom uniserial, mainly biserial or triserial, and fairly regular. Walls strongly wrinkled.

Zoœcia subfusiform.

Peristomes prominent.

DIMENSIONS.

	B.M., 60,538.
Length of zoœcia	·5–1 mm.
Diameter of zoœcia	·3–·5 ,,
Diameter of apertures	·15 ,,

FIGURES.

Pl. II. Fig. 8. Part of a zoarium, in which the wrinkling is obliterated by weathering; × 6 dia. Lower Greensand. Farringdon. **60,538.**

DISTRIBUTION.

ENGLAND:

Lower Greensand: Farringdon.

FOREIGN:

Rhodanian: Fontenoy, Yonne; Nozeroy, Jura.
Neocomian: St. Croix, Vaud.

AFFINITIES.

The zoarium of this variety is less Stomatoporiform than the rest of the series; the branches are biserial and triserial. The roughness of the zoarium, owing to the projection of the peristomes, is a conspicuous feature of the variety.

LIST OF SPECIMENS.

60,538. A somewhat weathered zoarium, encrusting a shell fragment. Lower Greensand. Farringdon, Berks. Cunnington Coll. Figd. Pl. II. Fig. 8.

D. 4504. With *Idmonea hagenowi* (Sharpe), on chert pebble. Lower Greensand. Farringdon. Cunnington Coll.

D. 5150. Two specimens, encrusting chert pebbles. Lower Greensand. Farringdon. Cunnington Coll.

D. 5151. A zoarium encrusting a chert pebble (on slide). Lower Greensand. Farringdon. Cunnington Coll.

c. **Proboscina crassa** (Röm.), var. **francorum** (Pergens), 1890.

SYNONYMY.

Stomatopora francorum, Pergens, 1890. Revision, p. 330.
Idmonea fasciculata, *pars*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 634, figs. 10–13.
Proboscina ,, (*ex. syn.*), d'Orbigny, 1854. *Ibid.* p. 857.
Alecto gracilis, *pars* (*non* Edw.), Lonsdale, 1850. In Dixon's Geol. Suss. pl. xviii. A, fig. 1*, 1*c* (*non* figs. 1*a*, *b*).

VARIETAL CHARACTERS.

Zoarium of narrow bands, which in the main are regularly biserial. The walls are coarsely wrinkled.

Peristomes high and prominent, with large apertures.

DIMENSIONS.

	D'Orbigny's type (*fide* Pergens).	B.M. D. 3844.
Length of zoœcia	?	·5–·8 mm.
Diameter of zoœcia	·12 mm.	·25 ,,
Diameter of aperture	·04 ,,	·18 ,,

DISTRIBUTION.

BRITISH:
Middle Chalk: Chatham.
Zone of *Micraster cortestudinarium*: Sussex.

Foreign:

Senonian—Santonian: Saintes, Charente-Inférieure.
Coniacian: Tours, Indre-et-Loire.
Turonian: Les Roches and Villardin, Loir-et-Cher; St. Germain, near Flèche, Sarthe.

Figure.

Pl. II. Fig. 10. Part of a zoarium in which the apertures are distant; × 8 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3844.**

Affinities.

M. Pergens proposed the trivial name *francorum* for a Bryozoan which d'Orbigny had referred to *P. fasciculata* (Reuss), but which Pergens rightly separated from that form. It is clearly a close ally of *P. crassa, divaricata*, of which it may be regarded as the Turonian and Senonian representative. M. Pergens has remarked that d'Orbigny's type of his *I. divaricata* (pl. 631, figs. 9–11) is unlike the figure, and thus it is perhaps useless to compare the figure with that of d'Orbigny's *I. fasciculata*, on which Pergens' species was founded. But the two figures, it may be noticed, agree in all essential characters, differing mainly by the greater width of the zoarial bands, in the *divaricata* variety. *P. crassa, francorum*, is so closely allied to the specimens of *P. crassa, divaricata*, from Farringdon, that their varietal separation is perhaps of doubtful value.

LIST OF SPECIMENS.

British.

D. 3844. A zoarium growing over *Micropora*, sp., on echinid fragment. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. II. Fig. 10.

D. 3845. A young zoarium, growing on an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

60,252. With *Stomatopora divaricata* (Röm.), on *Micraster cortestudinarium*. Middle Chalk. Sussex. Dixon Coll. Figd. as *Alecto gracilis*, *pars*, by Lonsdale, 1850, in Dixon's Geol. Suss. pl. xviii. a, figs. 1*, 1*c*.

D. 4200. With *Proboscina fasciculata* (Rss.), var. *toucasi* (d'Orb.), on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 3846. A zoarium with *Proboscina fasciculata* (Rss.), var. *toucasi*, on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 493. A young specimen with *Membranipora*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 3803. Encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3802. A zoarium closely resembling the type-specimen, encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3804. Encrusting an echinid plate (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3134. Two free fragments of zoaria (on slide). Upper Chalk. Kent. Simmons Coll.

D. 378. Encrusting a fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3806. A zoarium with very long branches (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 363. Encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 517. A young zoarium (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3821. A zoarium with subalternate apertures, on echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

D. 4885. A young zoarium (on slide). Turonian: Craie marneuse. Villardin. Purchased 1898.

d. Proboscina crassa (Röm.), var. alectodes.

VARIETAL CHARACTERS.

Zoarium of numerous, crowded, uniserial or Stomatoporiform branches, which expand into very irregular, biserial or multiserial bands.

Zoœcia cylindrical or subfusiform; walls smooth or wrinkled.

Peristomes not very prominent.

DIMENSIONS.

	B.M.	B.M.
	D. 3798.	D. 2683.
Length of zoœcia	·5–1·3 mm.	·5–·9 mm.
Diameter of zoœcia	·3–·5 ,,	·25–·35 ,,
Diameter of aperture	·15–·2 ,,	·07–·1 ,,

DISTRIBUTION.

BRITISH:

Upper Chalk: Houghton.
Middle Chalk: Chatham.

FOREIGN:

? Cenomanian: Le Mans, Sarthe.

FIGURES.

Pl. II. Fig. 3. Part of a zoarium which has uniserial branches from a biserial stem; × 12 dia. Middle Chalk: Chatham. Vine Coll. **D. 2683.**

Pl. II. Fig. 4. Part of a zoarium in which the young branches are Stomatoporiform with multiserial expansions; × 6 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3798.**

Pl. II. Fig. 5. Part of a reticular zoarium in which the distal branches are regular and triserial. Middle Chalk: Chatham. Gamble Coll. **D. 3817.**

AFFINITIES.

This variety is characterized by the great extent of its Stomatoporiform portion. Nearly all *Proboscinæ* pass through a *Stomatopora* stage, but in none is it so largely developed as in this variety. Its nearest ally is the variety *francorum*, from which it is not easily separated; but that variety has fewer uniserial zoœcia, larger peristomes, and a more regular zoarium. The name of this variety is suggested from *Alecto*, a well-known synonym of *Stomatopora*.

The British Museum Collection contains a specimen from the Cenomanian of Le Mans, which closely agrees with this variety. and has affinities to var. *elevata*. Its exact position cannot be safely determined from the single zoarium.

LIST OF SPECIMENS.

BRITISH.

D. 2683. A zoarium with raised peristomes and uniserial offshoots. Middle Chalk. Chatham. Vine Coll. Figd. Pl. II. Fig. 3.

D. 3798. An irregular zoarium with many uniserial branches. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. II. Fig. 4.

D. 3817. A zoarium with one branch approximating to that of *P. fasciculata*. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. II. Fig. 5.

D. 380. A zoarium encrusting a fragment of *Inoceramus* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3805. Encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3807. Encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3808. Encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3799. A loose zoarium encrusting *Echinocorys* fragment. Middle Chalk. Chatham. Gamble Coll.

D. 3827. Two zoaria encrusting *Echinocorys scutatus*, with *Membranipora*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 3832. Two zoaria with the branching more regular than usual; on echinid fragments. Middle Chalk. Chatham. Gamble Coll.

D. 3800. Encrusting a fragment of *Inoceramus*, sp., with *Micropora*, sp., and *Membranipora*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 3829. Encrusting an echinid fragment with *Proboscina radiolitorum* (Orb.). Middle Chalk. Chatham. Gamble Coll.

D. 3830. Eleven zoaria, encrusting echinid and molluscan fragments. Middle Chalk. Chatham. Gamble Coll.

D. 4160. Encrusting a shell fragment. Middle Chalk. Chatham. Gamble Coll.

D. 3783. With *Stomatopora granulata* (Edw.), on *Micraster cortestudinarium*. Middle Chalk. Chatham. Gamble Coll.

D. 2940. With *Stomatopora granulata* (Edw.) and '*Marginaria*' *römeri*, Lonsd., on *Echinocorys scutatus*. Upper Chalk. Houghton. Dixon Coll.

FOREIGN.

? **D. 3699.** A zoarium encrusting the stem of a *Spiropora verticillata* (Goldf.). Cenomanian. Le Mans. Jesson Coll.

e. **Proboscina crassa** (Röm.), var. **elevata.**

VARIETAL CHARACTERS.

Zoarium comprising some broad, multiserial tufts, which are Berenicoid in character.

Peristomes very much raised.

DIMENSIONS.

	B.M., D. 997.
Length of zoœcia	·5–·7 mm.
Diameter of zoœcia	·15–·2 ,,
Diameter of aperture	·05–·1 ,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURES.

Pl. II. Fig. 6. Part of a zoarium, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 997.**

AFFINITIES.

This variety is characterized by the height of the peristomes, and the irregular Berenicoid patches which occur at intervals.

The zoœcia of the uniserial branches are closely allied to those of *P. crassa, alectodes.*

D. 997. A zoarium encrusting a shell fragment (on slide). Middle Chalk. Chatham. Vine Coll. Figd. Pl. II. Fig. 6.

5. **Proboscina alternata**, d'Orbigny, 1853.

Synonymy.

Proboscina alternata, d'Orbigny, 1853. Bry. Crét. pl. 760, figs. 4–6.
,, ,, d'Orbigny, 1854. *Ibid.* p. 857.
,, ,, Pergens, 1890. Revision, p. 338.

Diagnosis.

Zoarium simple, biserial or triserial.
Zoœcia of medium length; transversely wrinkled.
Peristomes very tall.

Distribution.

Foreign:

Senonian—Maastrichtian: Fécamp, Seine-Inférieure; Sainte-Colombe, Manche, in Craie à baculites.
Coniacian: Joué, Indre-et-Loire, and Vendôme, Loir-et-Cher, in Craie de Villedieu.
Turonian: Villardin, Loir-et-Cher, in Craie marneuse.

Affinities.

This 'species' is a near ally of *P. crassa*, var. *francorum*, from which it differs by the great elevation of the peristomes. According to M. Pergens it is the adnate form of *Entalophora proboscidea.* It is closely allied to, and perhaps identical with, *P. linearis* (Rss.), from the Saxon Cenomanian. Among Cainozoic 'species' it presents most resemblance to *Diastopora partschi*, von Reuss,[1] the generic position of which, however, is doubtful, as in the larger specimens figured the zoœcia occur in alternate pairs.

D. 4841. A small zoarium encrusting a Bryozoan stem (on slide). Turonian: Craie marneuse. Villardin. Purchased 1898.

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[1] Von Reuss. Foss. Pol. Wien. Tert.: Naturw. Abh. vol. ii. p. 52, pl. vii. figs. 16, 17.

6. **Proboscina sarthacensis** (Pergens), 1890.

SYNONYMY.

Stomatopora sarthacensis, Pergens, 1890. Revision, p. 332.
Diastopora ramosa, Michelin, 1845. Icon. Zooph. p. 203, pl. lii. fig. 3.
Idmonea ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 175.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 632, figs. 1–3.
Proboscina ,, d'Orbigny, 1854. Bry. Crét. p. 851.
,, ,, *pars*, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 329.
Idmonea cenomana, d'Orbigny, 1851. Bry. Crét. pl. 633, figs. 1–3.
? *Idmonea depressa*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 109.
? ,, ,, d'Orbigny, 1851. Bry. Crét. pl. 631, figs. 12–14.
? *Proboscina* ,, d'Orbigny, 1854. *Ibid.* p. 849.
? ,, ,, Pergens, 1890. Revision, p. 338.
Proboscina gracilis (*non* Edw.), von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 113, pl. xxviii. figs. 6, 9.
? *Proboscina gracilis*, var. *reussi*, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 469, pl. xix. fig. 4.
? ,, ,, var. *reussi*, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 376.
? ,, ,, var. *reussi*, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 328.
Proboscina suessi, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 103, pl. v. figs. 14–19 (*non* pl. iv. figs. 25, 26).
,, ,, Fric, 1883. Isersch.: Arch. Naturw. Landesf. Böhm. vol. v. No. 2, p. 124.
,, ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 12.
,, *linguata*, Novak, 1877. *Op. cit.* p. 102, pl. v. figs. 20–23.
? *Proboscina dilatata*, var. *cantabrigiensis*, Vine, 1892. Addit. Cret. Polyz.: Proc. Yorks. Geol. Soc. vol. xii. p. 152, pl. vi. fig. 3.

DIAGNOSIS.

Zoarium irregularly branched. The branches are at first narrow and expand distally. The branches subdivide once or twice, and remain distinct. The zoarium is thick, especially at the distal ends of the branches.

Zoœcia long, cylindrical, and fairly stout. They are well raised distally. The apertures are irregular in distribution and widely spaced.

Gonocysts long, and irregular.

Dimensions.

	Pergens.	B.M., D. 441.	Novak's *P. suessi* (pl. v. fig. 17).
Length of zoœcia	·3–·4 mm.	·3–·5 mm.	·4 mm.
Diameter of zoœcia	·17–·2 ,,	·15 ,,	·07 ,,
Diameter of aperture	·05–·06 ,,	·07–·1 ,,	·04 ,,

Distribution.

England:

Middle Chalk: Chatham.
Red Chalk: Hunstanton.

Foreign:

Cenomanian: Kank, Jiné, Kamajk, and Zbislav, Bohemia, in Korycaner Schichten; Le Mans and St. Calais, Sarthe; Île Madame, Charente-Inférieure; and Tourtenay; Cap de la Hève, Seine-Inférieure, in Craie glauconieuse.
Rhodanian: Vassy, Haute-Marne; Nozeroy, Jura.

Figures.

Pl. III. Fig. 8. A zoarium from Middle Chalk, Chatham. The specimen is intermediate between the typical *P. sarthacensis* and *P. cornucopiæ* (Orb.). Fig. 8*a*, the zoarium, natural size; Fig. 8*b*, part of the same, × 14 dia. Gamble Coll. **D. 441.**

Affinities.

The name *Proboscina sarthacensis* was proposed by Pergens for the Bryozoa described by d'Orbigny as *Proboscina ramosa*, a name preoccupied owing to the transfer of Milne Edwards' *Alecto ramosa* to this genus. In the Cat. Jur. Bry. (pp. 62, 63) it was proposed to regard Pergens' species *S. sarthacensis* as identical with *Aulopora ramosa* of von Hagenow, but reconsideration of von Hagenow's diagnosis suggests a different interpretation of that species. It is probably after all a *Stomatopora*; but as Milne Edwards' *Alecto ramosa* predates the species named *ramosa* by von Hagenow, Michelin, and d'Orbigny, and as it is clearly not the same as Michelin's *Diastopora ramosa*, the name *P. sarthacensis* is valid. *P. suessi* of Novak is a variety with clavate branches, which proximally are usually narrow; *P. linguata*, Nov., appears to be the same, but with broader, shorter tufts.

The nearest allies of this form are *Proboscina fasciculata* (Rss.) and *P. cornucopiæ* (Orb.). From the former it differs by the greater width of the distal ends of the branches, by the fact that the branches do not anastomose as they so often do in that form, and by the branches subdividing less frequently. From *Prob. cornucopiæ* it differs owing to the greater diameter of the zoœcia and the less crowded arrangement of the peristomes; but the zoarial characters are very similar.

The Rhodanian form *Proboscina depressa* (Orb.) is probably a worn specimen of this 'species.' Vine's figure of his *Proboscina dilatata*, var. *cantabrigiensis*, is apparently based on the same form as his *P. gracilis*, *reussi*.

The *Cellepora echinata*, Münst.,[1] is apparently an Oligocene and Miocene ally of this species; its zoarium rather resembles that of *P. fasciculata*, but the crowded arrangement of the peristomes removes it from close affinity to that species.

LIST OF SPECIMENS.

British.

D. 441. On echinid fragment. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. III. Fig. 8.

D. 464. Encrusting an *Echinocorys*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 3816. Encrusting a fragment of *Echinocorys*, sp., with *Berenicea papillosa* (Rss.). Middle Chalk. Chatham. Gamble Coll.

D. 3861. Encrusting a fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 442. Encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2021. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Recorded as *Proboscina gracilis*, Reuss, var. *reussi*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 469, specimen No. 12. It is a young specimen.

D. 2022. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. The type of *Proboscina gracilis*, Reuss, var. *reussi*, Vine: *op. cit.* vol. xlvi. p. 469 (specimen No. 12a), pl. xix. fig. 4.

Foreign.

D. 4389. A zoarium with *Berenicea papillosa* (Rss.), var. *hagenowi*, encrusting a fragment of *Elasmostoma consobrina*. Cenomanian: Craie chloritée. Cap de la Hève. Presented by W. Hill, Esq., F.G.S.

D. 4386. A zoarium with *Berenicea regularis* (Orb.), var. *gamblei*, encrusting *Hemiaster*, sp. Villers-sur-Mer. Presented by W. Hill, Esq., F.G.S.

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[1] Goldfuss: Petref. Germ. p. 102, pl. xxxvi. fig. 14. Von Reuss, Foss. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. p. 52, pl. vii. figs. 14, 15.

7. **Proboscina cornucopiæ** (d'Orbigny), 1851.

SYNONYMY.

Idmonea cornucopiæ, d'Orbigny, 1851. Bry. Crét. pl. 634, figs. 7–9.
Proboscina ,, d'Orbigny, 1854. *Ibid.* p. 855.
,, ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.
,, ,, *pars*, Vine, 1893. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 307.
? ,, ,, var. *eximia*, 1893. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 307.
Stomatopora ,, Pergens, 1890. Revision, p. 331.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. p. 132.
Idmonea echinorum, d'Orbigny, 1851. Bry. Crét. pl. 633, figs. 11–13.
Proboscina subclavata, Reuss, 1872. Palæontogr. vol. xx. pt. 1, p. 113, pl. xxviii. fig. 5.
Tubulipora chathamensis, *pars*, Vine, 1893. Cret. Pol: Rep. Brit. Assoc. 1892, p. 308, No. 14.
Reptotubigera ramosa, *pars*, Vine, 1893. *Ibid.* pp. 308, 329.
,, ,, var. *irregularis*, Vine, 1893. *Ibid.* pp. 308, 329.

DIAGNOSIS.

Zoarium composed of from two to four multiserial branches, each of which is comparatively short, and expands more or less rapidly in width. The branches may be at first lanceolate and then suddenly expand, or they may expand uniformly from the beginning. The branches may subdivide.

Zoœcia long, narrow, cylindrical, and crowded.

Peristomes well raised. The apertures are irregularly distributed, and very crowded.

Gonocysts ovoid; of medium size.

DIMENSIONS.

	D'Orbigny's type (*fide* Pergens).	B.M. D. 485.	B.M. D. 440.
Distance of apertures ...	·24–·3 mm. ...	·3–·5 mm. ...	·3–·5 mm.
Diameter of zoœcia ...	·08–·1 ,, ...	·1–·12 ,, ...	·1–·16 ,,
Diameter of aperture ...	·04 ,, ...	·06 ,, ...	·06–·1 ,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:

Senonian—Maastrichtian: Meudon, near Paris.
Santonian: Arche de Lèves.
Coniacian: Tours, Indre-et-Loire; Vendôme, Loir-et-Cher; ? Villavard and Les Roches, Loir-et-Cher.
Cenomanian: Saxony, in Lower Pläner.

FIGURES.

Pl. III. Fig. 6. A specimen with irregular zoarium, with the peristomes locally in transverse series. Middle Chalk: Chatham. Fig. 6*a*, zoarium, natural size; Fig. 6*b*, part of a branch of the same, × 15 dia. Gamble Coll. **D. 485.**

Pl. III. Fig. 9. A regular zoarium. Middle Chalk: Chatham. Fig. 9*a*, zoarium, natural size; Fig. 9*b*, one branch of the same, × 12 dia. Gamble Coll. **D. 440.**

Pl. III. Fig. 10. One branch of a zoarium with two broken gonocysts, × 12 dia. Middle Chalk: Chatham. Vine Coll. **D. 2686.**

Pl. IV. Fig. 1. A large irregular zoarium with several gonocysts. Middle Chalk: Chatham. Fig. 1*a*, zoarium, × 6 dia.; Fig. 1*b*, part of the same, showing one whole and one broken gonocyst, × 18 dia. Vine Coll. **D. 986.**

AFFINITIES.

This species is one of those *Proboscinæ* in which the branches rapidly expand into broad Berenicoid sheets. Its nearest Cretaceous allies are *Proboscina dilatata*, which differs by having an unbranched zoarium with much stouter zoœcia, and *P. sarthacensis*, Perg., which has larger and more scattered zoœcia, and in which the branches are typically clavate.

Reuss's *P. subclavata* appears to be a fairly typical form of this species.

The slender zoœcia and their growth in crowded tufts are characters which distinguish this 'species' from the Cainozoic *Proboscinæ.*

LIST OF SPECIMENS.

D. 485. A large irregularly branched zoarium on fragment of *Inoceramus*, with *Micropora*, sp. In places the apertures occur in regular transverse series resembling those of *P. radiolitorum.* Middle Chalk. Chatham. Gamble Coll. Figd. Pl. III. Fig. 6.

D. 440. A regular zoarium on echinid fragment. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. III. Figs. 9*a*, *b*.

D. 2686. A zoarium, part of which is in the *echinorum* stage, with two broken gonocysts; it is encrusting an echinid fragment with *Berenicea*, sp. Middle Chalk. Chatham. Vine Coll. Figd. Pl. III. Fig. 10.

D. 986. A zoarium with gonocysts and the apertures locally quincuncial; encrusting an echinid fragment. Middle Chalk. Chatham. Vine Coll. The type of *Reptotubigera ramosa*, var. *irregularis*, Vine, 1893: Rep. Brit. Assoc. 1892 (1893), p. 308. Figd. Pl. IV. Fig. 1.

D. 3834. Two zoaria on a sponge fragment, with *Stomatopora gracilis* (Edw.) and *Berenicea papillosa* (Rss.). Middle Chalk. Chatham. Gamble Coll.

? D. 977. On echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll. The type of *P. cornucopiæ*, var. *eximia*, Vine: Rep. Brit. Assoc. 1892 (1893), p. 307, No. 6. A very young form, possibly in the *echinorum* stage.

D. 984. On echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Reptotubigera ramosa*, Vine, 1893: *ibid.* p. 308, No. 10.

D. 439. An irregular zoarium, encrusting echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 976. On echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll., specimen No. 5. Vine, 1893: *op. cit.* p. 307.

D. 3849. A zoarium with short, wide branches (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3847. A typical zoarium, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3836. A typical form encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3848. An irregular zoarium with gonocyst, encrusting echinid plate (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 365. A broken zoarium, encrusting fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 379. Encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3859. A zoarium with long branches, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 5153. A young zoarium with regular branches, encrusting echinid fragment. Middle Chalk. Chatham. Gamble Coll.

D. 3835. A zoarium with long, regular, narrow branches, on a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3850. A zoarium with the typical triradiate, flabellate form, on an *Inoceramus* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

? D. 2624. An indeterminable zoarium identified by Vine as *Proboscina cornucopiæ*, var. *eximia*. Middle Chalk. Chatham. Vine Coll.

D. 3858. A series of zoaria with gonocysts, encrusting *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll.

D. 3860. Nine zoaria of the irregular variety, encrusting echinid fragments. Middle Chalk. Chatham. Gamble Coll.

D. 3864. Seven zoaria, partly regular and partly irregular, encrusting echinid fragments. Middle Chalk. Chatham. Gamble Coll.

D. 4230. A zoarium of the type approximating to the form of *punctatella*, encrusting a fragment of *Echinocorys*. Middle Chalk. Chatham. Gamble Coll.

D. 3818. With *Micropora*, sp., on *Inoceramus* fragment. Middle Chalk. Chatham. Gamble Coll.

D. 2979. With *Berenicea papillosa* (Rss.) and *Hippothoa*, sp. Upper Chalk. Loc.? Toulmin Smith Coll.

D. 3820. Encrusting base of *Haplocœcia*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

8. **Proboscina radiolitorum** (d'Orbigny), 1851.

Synonymy.

Idmonea radiolitorum, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 200.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 633, figs. 8–10.
Proboscina ,, d'Orbigny, 1854. *Ibid.* p. 854.
,, ,, Reuss, 1854. Kreidesch. Ostalp.: Denk. Akad. Wiss. Wien. vol. vii. p. 137, pl. xxvii. fig. 14; pl. xxviii. fig. 7.
? ,, ,, Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 114, pl. xxviii. fig. 12.
,, ,, Stoliczka, 1873. Pal. Ind.: Cret. Fauna S. Ind. vol. iv. pt. 2, p. 30, pl. iii. fig. 6.
Reptotubigera ramosa, d'Orbigny, 1853. Bry. Crét. p. 754, pl. 751, figs. 1–3.
,, ,, Staring, 1860. Bodem Nederl. vol. ii. p. 400.
,, ,, Hamm, 1881. Bry. mastr. Ober-Sen. p. 30.
,, ,, Pergens & Meunier, 1886. Bry. gar. Faxe: Bull. Soc. mal. Belg. vol. xxi. p. 217.
,, ,, Peron, 1893. Descr. invert. foss. crét. Tunisie, p. 339, pl. xxx. figs. 5, 6.
,, ,, Pergens, 1890. Revision, p. 340.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. géol. Belge, vol. vi. p. 204.
,, *serpens*, d'Orbigny, 1853. Bry. Crét. p. 755, pl. 751, figs. 4–7.
,, ,, Staring, 1860. Bodem Nederl. vol. ii. p. 400.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 31.
Proboscina cornucopiæ, *pars*, Vine, 1893. Cret. Pol.: Rep. Brit. Assoc. 1892, p. 307.

Diagnosis.

Zoarium of numerous branches, which are usually simple and rounded at the ends. The branches may be narrow, uniform in width, and somewhat triangular in transverse section; or they may be irregular and expand distally.

Zoœcia short and crowded. The peristomes are slightly raised. The apertures are quincuncial or linear in arrangement, and usually in regular transverse rows.

DIMENSIONS.

	B.M., D. 2300.
Distance of apertures	·4 mm.
Diameter of zoœcia	·2 ,,
Diameter of apertures	·13 ,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Gravesend.
Middle Chalk: Chatham.

FOREIGN:

Senonian—Maastrichtian: Maastricht; Meudon, near Paris; Fécamp, Seine-Inférieure.
Santonian: Djebel Sidi-bou-Ghanem, Tunis; St. Paterne, Loir-et-Cher; Saintes, Perignac, Pons, etc., Charente-Inférieure.
Coniacian: Tours, Indre-et-Loire.
Turonian: Angoulême and Merpins, Charente; Ste. Maure, Indre-et-Loire; Les Roches, Lavardin, etc., Loir-et-Cher; Nefgraben, Gosau.
Arrialoor Series: Poodoopolliam, S. India.
Cenomanian: Schillinge, Bohemia; Saxony, in Lower Pläner.

FIGURE.

Pl. III. Fig. 5. Part of a zoarium, × 15 dia. Upper Chalk: ? Gravesend. Presented by F. Harford, Esq. **D. 2300.**

AFFINITIES.

This 'species' is most nearly allied to *Proboscina fasciculata*, var. *toucasi*, *P. sarthacensis*, and *P. cornucopiæ*. It agrees with them in the size and general characters of the zoarium; but it differs from them all by the regular quincuncial arrangement of the apertures. In this respect it approaches *Idmonea*, to which (under its synonym of *Reptotubigera*) this species is referred by Pergens. But it seems to me more natural to regard this species as only a *Proboscina* with linear peristomes than as an *Idmonea*: the zoœcia are not in alternate series as in that genus: the general characters of the zoœcia are Tubuliporidan, not Idmoniiform. The specimen illustrated by Fig. 1 illustrates the accidental character of the linear series of peristomes in this species. One branch of the zoarium has the peristomes in regular transverse series, situated further apart than in the typical form of *radiolitorum*, and approaching the condition of '*Reptotubigera marginata*,' Orb.[1] In the adjacent branch the zoœcia are quite irregular in arrangement.

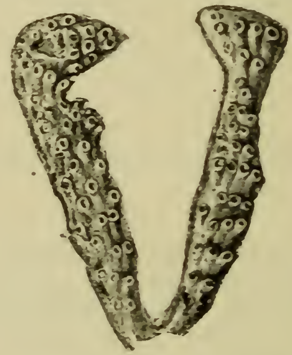

FIG. I.—*Proboscina radiolitorum* (Orb.); two branches of the same zoarium, one with irregular and one with regular transverse series of apertures. Middle Chalk: Chatham. Vine Coll. **D. 975.**

A specimen of *P. cornucopiæ* (No. **D. 485**) also shows a local adoption of a linear arrangement of the peristomes.

The Jurassic representative of this species is *P. eudesi*, Haime,[2] which has smaller apertures and a flatter zoarium.

LIST OF SPECIMENS.

BRITISH.

D. 300. On fragment of *Inoceramus*. Upper Chalk. Gravesend? Presented by F. Harford, Esq. Figd. Pl. III. Fig. 5. The typical form of this species.

D. 3857. Encrusting a fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

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[1] D'Orbigny: Bry. Crét. p. 753, pl. 750, figs. 19–21.

[2] Haime. Mon. Bry. Jur.: Mém. Soc. géol. France, ser. 2, vol. v. p. 167, pl. v. figs. 9*a*, *b*.

D. 3856. Encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 5149. Encrusting a fragment of *Micraster*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 5152. A young zoarium. Middle Chalk. Chatham. Gamble Coll.

D 4170. With *Homalostega*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 975. A branched zoarium, with one branch having slightly distant, regular, transverse series of peristomes, and another branch having the apertures quite irregular in arrangement. Middle Chalk. Chatham. Vine Coll. Recorded by Vine as *Proboscina cornucopiæ*: Rep. Brit. Assoc. 1892, p. 307, No. 5. Figd. as Fig. 1, p. 50.

D. 2980. On *Inoceramus* fragment. Middle Chalk. Chatham. Gamble Coll. A form with narrow banded zoarium.

D. 3829. A zoarium with *Proboscina crassa* (Röm.), var. *alectodes*, on an echinid fragment. Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

? **D. 3580.** An elongate, thick zoarium of the var. *serpens* (Orb.), with the apertures at the distal ends tending towards a linear arrangement. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 4848. A broken zoarium of var. *serpens*. Turonian: Craie marneuse. Les Roches, Loir-et-Cher. Purchased 1898.

9. **Proboscina anomala**, Reuss, 1872.

SYNONYMY.

Proboscina anomala, Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 114, pl. xxviii. fig. 8.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 15.
,, *elevata*, d'Orbigny, var., Vine, 1893. Compl. Rep.: Brit. Assoc. 1892, p. 307.

DIAGNOSIS.

Zoarium of long, narrow, serpuliform bands, which are irregular in width and rather thick. The zoarium may consist of a single band, or it may be slightly branched. Each band consists of from two to five zoœcia in width.

Zoœcia mostly short, but their length is variable; usually they are crowded, but in places their whole length may be seen. Walls transversely striate.

Peristomes well raised; irregularly distributed.

Gonœcial expansions occurring as knot-shaped enlargements of the zoarium.

DISTRIBUTION.

ENGLAND:

Upper Chalk: Broadstairs; Gravesend.
Zone of *Actinocamax quadratus*: East Harnham.
Middle Chalk: Chatham.

FOREIGN:

Senonian: Rügen (*fide* Marsson).
Cenomanian—Lower Pläner: Saxony.

FIGURES.

Pl. II. Fig. 9. A zoarium encrusting *Galerites albogalerus*. Upper Chalk: Kent. Fig. 9*a*, part of zoarium with an expansion (? gonœcial), × 12 dia.; Fig. 9*b*, lower part of the same zoarium, × 12 dia. Bowerbank Coll. **D. 2976.**

AFFINITIES.

The zoarium of this species resembles the specimen described by d'Orbigny as *Reptotubigera serpens*;[1] but it differs from that form by the irregular arrangement of its orifices. Its serpuliform zoarium also calls attention to its possible affinity to the *P. serpulæformis* (Röm.),[2] which, however, has a much broader zoarium and linear series of peristomes, and is possibly specifically identical with *Proboscina radiolitorum* (Orb.).

The 'species' is exceptionally well marked owing to its narrow, ridged zoarium, and the great irregularity in the arrangement of the orifices along this ridge.

LIST OF SPECIMENS.

D. 2976. On *Galerites albogalerus* (Leske). Upper Chalk. Kent. Bowerbank Coll. Figd. Pl. II. Figs. 9*a*, *b*.

D. 978. With *Berenicea regularis* (Orb.), var. *ambita*, Greg. (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *P. elevata*, var., Vine: Rep. Brit. Assoc. 1892 (1893), p. 307, specimen No. 7.

B. 805. With *Actinopora Berenicea*, etc., on *Echinocorys scutatus*, Leske. Upper Chalk. Broadstairs, Kent. Presented by Mrs. Burnett, 1882.

B. 3741. Encrusting *Spinopora*. Upper Chalk. Gravesend. F. Harford Coll.

D. 4277. On echinid fragment. Upper Chalk: zone of *Actinocamax quadratus*. East Harnham. Gamble Coll.

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[1] D'Orbigny: Bry. Crét. p. 755, pl. 751, figs. 4–7.

[2] *Rosacilla serpulæformis*, Römer: Verst. nordd. Kr. p. 19, pl. v. fig. 16.

D. 4269. With *Membranipora* and *Cribrilina* on *Echinocorys scutatus.* Middle Chalk Chatham. Gamble Coll.

D. 3801. Encrusting fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3852. Encrusting echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3853. Encrusting echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3851. Encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

10. **Proboscina bohemica,** Novak, 1877.

SYNONYMY.

Proboscina bohemica, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 101, pl. v. figs. 24, 25.
,, ,, Fric, 1883. Isersch.: Arch. Naturw. Landesf. Böhm. vol. v. No. 2, p. 124, fig. 105.
,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 472.
,, ,, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 377.
Diastopora ,, Hamm, 1881. Bry. mastr. Ober-Sen. pt. i. p. 25.
Proboscina diffluens, Novak, 1877. *Op. cit.* p. 102, pl. v. figs. 10–13.
Diastopora ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 16, pl. ii. figs. 12, 13.
Proboscina claviformis, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 470.
,, *subelegans* (*non* Orb.), Vine, 1890. *Ibid.* p. 470.
,, ,, (*non* Orb.), Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 376.
,, ,, (*non* Orb.), Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 328.
Diastopora bacca, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 15, pl. i. figs. 17, 18.
? *Proboscina cornucopiæ* (*non* Orb.), *pars,* Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 307.

DIAGNOSIS.

Zoarium irregular, in broad, lobed branches, with or without a narrow marginal selvage.

Zoœcia large and not very clearly marked off from one another. The apertures in the younger parts of the branches are arranged in lines, running obliquely across the zoarium. Near the ends of the branches the zoœcia are crowded. The peristomes are slightly raised. The surface is plain or corrugated.

AFFINITIES.

This 'species' is most nearly allied to *P. sarthacensis*, but it differs by having much larger zoœcia. The zoœcia are also shorter, and the peristomes crowded together. It agrees with *P. cornucopiæ* in the last character, but is easily distinguished by the small size of the zoœcia in that 'species.' In the typical Cenomanian form the zoarium is simple and consists of a Berenicoid expansion. In the Senonian variety the zoarium is branched, and usually consists of long bands, irregular in width.

a. **Proboscina bohemica**, Nov., var. **typica.**

DIMENSIONS.

	Novak.	B.M., D. 4316.
Length of zoœcia ...	·5 mm. ...	·5 mm.
Diameter of zoœcia ...	·25 ,, ...	·25 ,,
Diameter of aperture ...	·12 ,, ...	·1 ,,

DISTRIBUTION.

ENGLAND:
Upper Chalk—Zone of *Actinocamax quadratus*: East Harnham, Wilts.
Red Chalk: Hunstanton.

FOREIGN:
Cenomanian: Gross-Ujezd, Bohemia, in Iser Schichten; Jiné, Kamajk, and Kank, Bohemia, in Korycaner Schichten.

FIGURE.

Pl. IV. Fig. 2. A zoarium encrusting an *Exogyra*, sp. Zone of *Actinocamax quadratus*: East Harnham, Wilts. Gamble Coll. Vine's *P. bohemica*, var. *delicatula*. **D. 4316.**

LIST OF SPECIMENS.

D. 4316. An irregular zoarium encrusting an *Exogyra*, sp. Zone of *Actinocamax quadratus*. East Harnham, near Salisbury. Gamble Coll. Vine's var. *delicatula*. Figd. Pl. IV. Fig. 2.

D. 2031. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Figd. by Vine, 1890: Quart. Journ. Geol. Soc. vol. xlvi. pl. xix. fig. 9. A badly preserved specimen.

D. 2023. A young specimen on an *Inoceramus*, sp., with *Berenicea folium*, Nov. Red Chalk. Hunstanton. Jesson Coll. Vine's type of *P. claviformis*. Recorded as *P. subelegans*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 470, No. 13A.

b. **Proboscina bohemica**, Nov., var. **chathamensis** (Vine).

SYNONYMY.

Tubulipora chathamensis, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 308.

VARIETAL CHARACTERS

Zoarium of long, irregular branches, with a narrow marginal selvage at the same height as the rest of the zoarium. Surface strongly corrugated.

Peristomes well raised; very irregular in distribution.

DISTRIBUTION.

ENGLAND:

Middle Chalk: Chatham.

FIGURES.

Pl. III. Fig. 1. An irregular zoarium of var. *chathamensis*. Middle Chalk: Chatham. Fig. 1*a*, the zoarium, natural size; Fig. 1*b*, part of the same, × 10 dia. Gamble Coll. **D. 2978.**

LIST OF SPECIMENS.

D. 2978. With *Stomatopora granulata* (Edw.) and *Micropora*, sp., on fragment of *Echinocorys*. Middle Chalk. Chatham. Presented by W. Gamble, Esq., 1889. Figd. Pl. III. Fig. 1.

D. 996. On echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll. The type of *Tubulipora chathamensis*, Vine, 1893: *op. cit.* p. 308. The zoarium consists of broad bands which expand slightly.

D. 3819. A zoarium encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3862. Encrusting an echinid fragment. A thick zoarium with well raised peristomes, with *Proboscina fasciculata* (Rss.), var. *toucasi* (Orb.), on slide. Middle Chalk. Chatham. Gamble Coll.

D. 3867. Encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

? **D. 3869.** The worn central part of a zoarium with distant apertures, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3866. Encrusting an echinid fragment, with *Proboscina fasciculata* (Rss.), var. *toucasi* (Orb.), and *Micropora*, sp. Middle Chalk. Chatham. Gamble Coll.

11. **Proboscina parasitica** (von Hagenow), 1851.

Synonymy.

Tubulipora parasitica, von Hagenow, 1851. Bry. Maastr. Kr. p. 14, pl. i. fig. 1.
,, ,, Staring, 1860. Bodem Nederl. vol. ii. p. 402.

Diagnosis.

Zoarium short and thick, and usually simple; increasing rapidly in width. Surface corrugated.

Zoœcia long; the distal ends are highly raised, and not crowded.

Distribution.

England:
Middle Chalk: Chatham.

Foreign:
Senonian—Maastrichter Kreide: Maastricht.

Figures.

Pl. II. Fig. 7. A branched zoarium. Middle Chalk: Chatham. Fig. 7*a*, the whole zoarium seen from the side, nat. size; Fig. 7*b*, the same specimen from above, × 8 dia. Vine Coll. **D. 998.**

Affinities.

The characters of the zoœcia present a striking resemblance to those of the *Pustulipora tubulosa* of von Hagenow; but the cylindrical, erect stem of the latter, with its solid axis, is sufficient distinction.

Its nearest ally is *P. elevata* (Orb.), from which it differs by the freedom of the distal ends of the zoœcia. The peristomes are distant instead of being packed into a dense mass.

LIST OF SPECIMENS.

D. 998.	A small forked zoarium. Middle Chalk. Chatham. Vine Coll. Figd. Pl. II. Fig. 7.
D. 527.	A young zoarium encrusting a thin stem. Middle Chalk. Chatham. Gamble Coll.
D. 3983.	Two zoaria with slender zoœcia and very tall peristomes (on slide). Middle Chalk. Chatham. Gamble Coll.
D. 3984.	A zoarium with larger zoœcia (on slide). Middle Chalk. Chatham. Gamble Coll.

12. **Proboscina elevata** (d'Orbigny), 1853.

SYNONYMY.

Reptotubigera elevata, d'Orbigny, 1853. Bry. Crét. p. 755, pl. 760, figs. 1–3.
Stomatopora ,, Pergens, 1890. Revision, p. 333.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 203.
Tubulipora cenomana, d'Orbigny, 1851 and 1854. Bry. Crét. p. 833, pl. 631, figs. 3–5.

DIAGNOSIS.

Zoarium short and simple; beginning as a narrow uniserial or biserial band, and rapidly expanding to a multiserial colony. The zoarium is typically piriform in outline. The zoarium is very thick at the distal end owing to the height of the crowded zoœcia.

Zoœcia long and bent. In the young portion of the zoarium they are seen throughout their length; but in the distal end only the peristomal portions are seen.

DIMENSIONS.

	Pergens.	B.M., D. 4148.
Length of zoarium	— ...	4 mm.
Width of zoarium	1–2 mm. ...	1·5 ,,
Thickness of zoarium ...	— ...	1 ,,
Diameter of zoœcia	·2 ,, ...	·17–·25 ,,
Diameter of aperture ...	·10–·12 ,, ...	·08 ,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:
Senonian—Maastrichtian: Meudon; Ste. Colombe, Manche.
Santonian: Saintes, Charente-Inférieure; St. Paterne, Loir-et-Cher; Beauvais, Oise.
Coniacian: Tours, Indre-et-Loire.
Turonian: Moutier, Charente; Villardin, Loir-et-Cher.
Cenomanian: Le Mans, Sarthe.

FIGURE.

Pl. IV. Fig. 3. The distal end of a zoarium attached to a fragment of *Inoceramus*. Middle Chalk: Chatham. × 12 dia. Gamble Coll. **D. 4148.**

AFFINITIES.

The typical form of this species is the *Reptotubigera elevata* of d'Orbigny, in which the zoarium at the distal end expands into a broad, thick knob. The British Museum collection contains a specimen from the Maastrichter Kreide, which differs from the French form by the greater elongation of the zoarium. The specimen from Chatham agrees with the typical form.

LIST OF SPECIMENS.

BRITISH.

D. 4148. A slightly broken zoarium. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. IV. Fig. 3.

D. 516. A zoarium on a fragment of *Echinocorys*, sp. Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

D. 4847. A young zoarium encrusting a stem of *Entalophora*, sp. (on slide). Turonian—Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

13. **Proboscina hunstantonensis**, Vine, 1890.

SYNONYMY.

Proboscina hunstantonensis, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 470, pl. xix. fig. 5.
,, ,, Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 376.
,, ,, var. *ampliata*, Vine, 1890. *Op. cit.* p. 470, pl. xix. fig. 6.
,, ,, var. *ampliata*, Vine, 1891. *Op. cit.* p. 376.
,, *ramosa*, Vine, 1889. Greensd. Pol. pt. ii.: Proc. Yorks. Geol. Soc. vol. xi. p. 264, pl. xii. figs. 5-8.
,, ,, Vine, 1890. *Op. cit.* p. 473.
,, ,, Vine, 1891. *Op. cit.* p. 377.
? ,, *dilatata* (*non* Orb.), var., Seeley, 1866. Foss. Up. Gr. Hunst.: Ann. Mag. Nat. Hist. ser. 3, vol. xvii. p. 181.
,, ,, var. *cantabrigiensis*, Vine, 1889. Greensd. Pol. pt. ii.: Proc. Yorks. Geol. Soc. vol. xi. p. 263, pl. xii. figs. 3, 4.
,, ,, Vine, 1890. *Op. cit.* p. 473.
,, ,, Vine, 1891. *Op. cit.* p. 377.
non ,, ,, Vine, 1892. Add. Cret. Pol.: Proc. Yorks. Geol. Soc. vol. xii. p. 151, pl. vi. fig. 3.
? ,, *clementina*, Vine, 1892. *Ibid.* p. 154, pl. vi. fig. 5.

DIAGNOSIS.

Zoarium simple and long; of an irregular multiserial band, formed of from 6–8 zoœcia in width, and broken up into segments by constrictions.

Zoœcia long; in well-preserved specimens transversely wrinkled. The zoœcia are fairly straight or sinuous.

Apertures large, irregularly distributed, and often so distant that the zoœcia can be seen throughout their length. Peristomes slightly raised.

DIMENSIONS.

		Type of var. *cantabrigiensis.* D. 2937.		Type of *hunstantonensis.*
Length of zoœcia	...	1·3 mm.	...	1·4 mm.
Diameter of zoœcia	...	·25 ,,	...	·2–·25 ,,
Diameter of aperture	...	·12 ,,	...	·1 ,,

DISTRIBUTION.

Upper Greensand: Cambridge.
? Gault: Barnwell, Cambridge.
Red Chalk: Hunstanton.

FIGURES.

Pl. IV. Fig. 4*a*. Zoarium of Vine's type of *Proboscina dilatata*, var. *cantabrigiensis*, encrusting a *Radiolites*; nat. size. Fig. 4*b*, part of the same, × 10 dia. Upper Greensand: Cambridge. Jesson Coll. **D. 2937.** In other parts of the zoarium the sinuosity and transverse wrinkling of the zoœcia are shown.

AFFINITIES.

This 'species' presents a considerable resemblance to *Proboscina dilatata* (Orb.), by the form of the zoarium and the size of the zoœcia. But it differs from the French 'species' by the greater length of the zoœcia and less crowded arrangement of the apertures. Pergens suggests that *P. dilatata* is perhaps the same as *P. angustata*, the dimensions being the same in both. *P. hunstantonensis* agrees better in this respect with *P. ramosa* (Edw.) than with *P. angustata.*

Vine has described a variety of *P. hunstantonensis* with the name of *ampliata.* His type-specimen is in the Museum collection, No. **D**. **2026**. It does not show the narrow, constricted mouth conspicuous in Vine's figure (Quart. Journ. Geol. Soc. vol. xlvi. pl. xix. fig. 6*b*). The type of Vine's *Proboscina clementina* cannot be found in his collection, and his figure is indefinite.

The Jurassic representative of this species is *P. jacquoti*, Haime,[1] which has even longer zoœcia, while the zoarium consists of flabellate tufts connected by a narrow stolon-like band.

LIST OF SPECIMENS.

D. 2937. Encrusting *Radiolites mortoni*. Upper Greensand. Cambridge. Jesson Coll. Figd. as *P. dilatata*, var. *cantabrigiensis*, Vine, 1889: Proc. Yorks. Geol. Soc., new ser., vol. xi. p. 263, pl. xii. fig. 3. Figd. Pl. IV. Figs. 4*a*, *b*.

D. 2938. Encrusting *Radiolites mortoni*. Upper Greensand. Cambridge. Jesson Coll. Figd. as *Proboscina ramosa* by Vine, 1889: *op. cit.* pl. xii. fig. 7. The specimen is badly preserved, but appears to belong to the same species as the preceding specimen.

D. 2965. With *Stomatopora granulata* (Edw.), encrusting *Pharetrospongia strahani*. Upper Greensand. Cambridge. Jesson Coll.

D. 2027. On *Inoceramus*, with *Berenicea contracta*, Seeley. Red Chalk. Hunstanton. Jesson Coll. The type of *Proboscina hunstantonensis*, Vine: *ibid.* p. 470, pl. xix. figs. 5*a*, *b*. The specimen (Vine, No. 17A, *t*) is not well preserved, and is only placed on the evidence of the other specimen included by Vine in this species.

D. 2028. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. *Prob. hunstantonensis*, var., Vine.

D. 2024. On *Inoceramus*. Red Chalk. Hunstanton. Jesson Coll. Described by Vine as *Proboscina ramosa*, ? Orb.: Quart. Journ. Geol. Soc. vol. xlvi. p. 473. (Vine's No. 14A.) It is a young specimen of the same form as **D. 2026**.

D. 2026. On *Inoceramus*. Red Chalk. Hunstanton. Jesson Coll. The type of *Proboscina hunstantonensis*, Vine, var. *ampliata*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 470, pl. xix. figs. 6*a*–*d*. (Vine's No. 16A.)

14. **Proboscina dilatata** (d'Orbigny), 1851.

SYNONYMY.

Idmonea dilatata,	d'Orbigny, 1851.	Bry. Crét. pl. 632, figs. 4–6.
,, ,,	d'Orbigny, 1854.	*Ibid.* p. 851.
Stomatopora ,,	Pergens, 1890.	Revision, p. 332.

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[1] Haime. Mon. Bry. Jur.: Mém. Soc. géol. France, ser. 2, vol. v. p. 169, pl. vii. figs. 5*a*, *b*; and Cat. Jur. Bry. p. 64, pl. ii. fig. 2.

Proboscina uberrima, Vine, 1890. Bry. Red Chalk: Quart. Journn. Geol. Soc. vol. xlvi. p. 469, pl. xix. fig. 3.
,, *irregularis*, *pars*, Vine, 1890. *Op. cit.* p. 468, pl. xix. figs. 2*a*, *b*.

DIAGNOSIS.

Zoarium simple, of a short, irregular, multiserial band.
Zoœcia short, transversely wrinkled, crowded together.
Peristomes highly raised.

DIMENSIONS.

		Vine's type of *irregularis* (figs. *a*, *b*).		D'Orbigny's type (*fide* Pergens).
Length of zoœcia	...	1·0 mm.	...	—
Diameter of zoœcia	...	·25 ,,	...	·3 mm.
Diameter of aperture	...	·1 ,,	...	·12–·16 ,,

DISTRIBUTION.

BRITISH:
Red Chalk: Hunstanton.
FOREIGN:
Cenomanian: Le Mans, Sarthe.

AFFINITIES.

This species is accepted for some badly preserved specimens from the Red Chalk of Hunstanton. The zoœcia agree in dimensions and general characters with those of *P. hunstantonensis*, Vine, of which this form may be a variety. They differ by the greater elevation and more crowded character of the peristomes.

The Jurassic representative of this species is *Proboscina jacquoti*, Haime, in which it is especially allied to the var. *expansa*; that variety has similar zoœcial characters, but a more regular and branched zoarium.

LIST OF SPECIMENS.

D. 2020. On *Inoceramus*, sp. Red Chalk. Hunstanton. Jesson Coll. The type of *Proboscina uberrima*, Vine, 1890: Quart. Journ. Geol. Soc. vol. xlvi. p. 469, pl. xix. figs. 3*a*, *b*. A young and rather thick specimen.

D. 2018. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. The type of *Prob. irregularis*, Vine, 1890: *op. cit.* pp. 468, 469 (No. 10), pl. xix. figs. 2*a*, *b*.

D. 2361. On *Inoceramus*. Red Chalk. Hunstanton. Jesson Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **angula** (Pocta), 1892.

Syn. *Diastopora angulus*, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 15, pl. ii. figs. 31, 32.

Char.—Zoarium a simple band, triangular in cross-section. Peristomes irregularly arranged, but with a tendency towards an oblique linear arrangement, ·03 to ·04 mm. in diameter.

Distrib.—Cenomanian—Korycaner Schichten: Kank, Bohemia.

Aff.—Nearly allied to *P. radiolitorum* (Orb.), but with more slender zoœcia.

2. **complanata**, Reuss, 1854.

Syn. *Proboscina complanata*, Reuss, 1854. Kreidesch.-Ostalp.: Denk. Akad. Wiss. Wien. vol. vii. pl. xxviii. fig. 8.

Char.—A young unbranched zoarium, with from 1-5 zoœcia in width; orifices distant, irregularly quincuncial.

Distrib.—Turonian: Nefgraben, Gosau.

Aff.—This is possibly a young form of *P. radiolitorum* (Orb.), or of *P. angustata* (Orb.).

3. **divaricata** (*non* Römer), Pocta, 1892.

Syn. *Stomatopora divaricata*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 11, pl. i. figs. 1, 4.

Char.—Zoarium uniserial-multiserial; branching irregular. Zoœcia subelliptical, like those of *Stomatopora calypso*. Apertures irregular in distribution, distant. Zoœcia ·5 to ·7 mm. long, ·3 to ·5 mm. broad; apertures ·08 to ·12 mm. in diameter.

Distrib.—Cenomanian—Korycaner Schichten: Kank, Bohemia.

4. **echinata** (Münst.), 1829.

Syn. *Cellepora echinata*, Münster, in Goldfuss, 1829. Petref. Germ. p. 102, pl. xxxvi. fig. 14.
,, ,, Hagenow, 1839. Neu. Jahrb. 1839, p. 279.
Aulopora (*Cellepora*) *echinata*, Römer, 1840. Verst. nordd. Kr. p. 18.

Char.—Zoarium irregular, branched; apertures well raised, irregular in arrangement; zoœcia long.

Distrib.—Oligocene: Astrup. (Type.)
Senonian: Rügen (*fide* von Hagenow and Römer).

Aff.—The Cretaceous specimens referred to this species may belong to *P. fasciculata*.

5. **fascicularis** (d'Orbigny), 1850.

SYN. *Tubulipora fascicularis*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 87.
,, ,, d'Orbigny, 1851-4. Bry. Crét. p. 832, pl. 631, figs. 9-11.
,, ,, Pergens, 1890. Revision, p. 338.

CHAR.—Zoarium short, thick, simple, piriform. Zoœcia short, crowded, cylindrical, with the distal ends curved upward.

DISTRIB.—Rhodanian: Vassy, Haute-Marne.

AFF.—The type is said by Pergens to be too young for determination.

6. **gigantopora**, Vine, 1890.

SYN. *Proboscina gigantopora*, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 471, pl. xix. figs. 8*a*, *b*.

DISTRIB.—Red Chalk: Hunstanton.

AFF.—This may be a specimen of *P. dilatata*, Orb. The type is in the British Museum, No. **D. 2030**. Jesson Coll.

7. **hagenowi** (Reuss), 1846.

SYN. *Aulopora hagenowi* (ex. syn.), Reuss, 1846. Verst. böhm. Kr. p. 66, pl. xv. figs. 38, 39.
,, ,, Fric, 1870. Pal. Unters. einzeln. Sch.: Arch. naturw. Landesf. Böhm. vol. i. pt. 2, p. 195.
Stomatopora ,, Bronn, 1848. Ind. Pal., Nomencl., p. 1202.
,, *ramosa*, *pars*, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.

CHAR.—Zoarium very irregular; of long Stomatoporiform branches, which frequently unite and expand into biserial or multiserial tufts. Zoœcia long and slender. Apertures distant in the branches, but crowded in the multiserial areas.

DISTRIB.—Cenomanian—Korycaner Schichten: Schillinge, near Bilin; Friedrichsberg, near Velim, Bohemia.

AFF.—An ally of *P. ramosa* (Edw.), but with more irregular zoarium and the apertures locally crowded together. Bronn and von Reuss quoted as a synonym *Aulopora ramosa*, Hag.[1] But the description by von Hagenow[2] and the figure by Römer both appear to show that form to be a *Stomatopora*.

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[1] Von Hagenow, 1839. Mon. Rüg.: Neu. Jahrb. 1839, p. 291.

[2] Römer, 1840. Verst. nordd. Kr. p. 18, pl. v. fig. 15.

8. **inornata**, Vine, 1892.

Syn. *Proboscina inornata*, Vine, 1892. Proc. Yorks. Geol. Soc., new ser., vol. xii. p. 151, pl. vi. fig. 4.

Char.—Zoarium irregular, uniserial or triserial; zooecia short, piriform.

Distrib.—Red Chalk: Hunstanton.

9. **irregularis**, *pars*, Vine, 1890.

Syn. *Proboscina irregularis*, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 468, pl. xix. figs. 2*c*, *d*.

Distrib.—Red Chalk: Hunstanton.

Aff.—The type-specimen of Vine's variety A is No 10* in Jesson Coll. B.M., **D. 2019** is generically indeterminable. The typical form of the 'species' (figs. 2*a*, *b*) is a synonym of *P. dilatata*.

10. **linearis** (Reuss), 1872.

Syn. *Tubulipora linearis*, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 115, pl. xxxiii. fig. 17.

Char.—A narrow-banded zoarium, with alternate, single, highly raised peristomes.

Distrib.—Cenomanian—Lower Pläner: Saxony.

Aff.—Allied to *P. alternata* (Orb.).

11. **marginata** (d'Orbigny), 1853.

Syn. *Proboscina marginata*, d'Orbigny, 1853–4. Bry. Crét. p. 849, pl. 759, figs. 4, 5.
,, ,, Pergens, 1890. Revision, p. 338.
,, *ricordeauana*, d'Orbigny, 1853–4. Bry. Crét. p. 850, pl. 759, figs. 6, 7.
,, ,, Pergens, 1890. Revision, p. 338.

Char.—Zoarium branching; broad, club-shaped branches. Zooecia fusiform, transversely striate.

Distrib.—Aptian: Les Croutes, Aube; Gurgy, Yonne.

Aff.—M. Pergens considers the above as synonyms, and remarks that the types of both are worn; this character is not suggested by the figures, which may therefore be diagrammatic.

12. parca (Römer), 1840.

Syn. *Tubulipora parca*, Römer, 1840. Verst. nordd. Kr. p. 19, pl. v. fig. 17.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.

Char.—Zoarium simple, with highly raised peristomes.

Distrib.—Senonian: Peine, near Hannover.

13. procera (Pocta), 1892.

Syn. *Diastopora procera*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 17, pl. iv. figs. 23, 24.

Char.—Thick-branching, narrow-banded zoarium. Apertures in irregular transverse series, or quite irregular. (The zoarium is apparently very worn, and the characters are doubtful.)

Distrib.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

14. protracta (Pocta), 1892.

Syn. *Diastopora protracta*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 16, pl. i. figs. 15, 16.

Char.—Zoarium multiserial. Zoœcia large, with highly raised peristomes. somewhat regularly distributed.

Distrib.—Cenomanian—Korycaner Schichten: Kank, Bohemia.

15. punctatella, von Reuss, 1854.

Syn. *Proboscina punctatella*, von Reuss, 1854. Kreideschr. Ostalp.: Denk. Akad. Wiss. Wien, vol. vii. p. 137, pl. xxvii. figs. 11, 12.
,, ,, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 113, pl. xxviii. fig. 7.

Char.—Zoarium irregularly branched; multiserial branches. Apertures in irregular, transverse series. Zoœcia large.

Distrib.—Turonian: Gosau.
Cenomanian—Lower Pläner: Saxony.

Aff.—Allied to *P. radiolitorum* (Orb.), but with larger zoœcia and less regular rows of apertures.

16. pustulosa (Giebel), 1848.

Syn. *Aulopora pustulosa*, Giebel, 1848. Polyp. Plänerm. Quedl.: Zeit. Zool. Zoot. vol. i. p. 11.

Char.—Probably a near ally of *P. hagenowi* (Rss.).

Distrib.—Cenomanian—Lower Pläner: Kluss, near Quedlinburg.

17. **serpulæformis** (Römer), 1840.

Syn. *Rosacilla serpulæformis*, Römer, 1840. Verst. nordd. Kr. p. 19, pl. v. fig. 16.

Proboscina serpulæformis, von Reuss, 1846. Verst. böhm. Kr. p. 66, pl. xv. fig. 40.

,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 14.

Diastopora serpulæformis, von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.

Char.—Zoarium simple, ridged, broad, with small zoœcia, having the peristomes in linear series.

Distrib.—Senonian: Rügen.
Cenomanian—Lower Pläner: Schillinge, near Bilin, and Gehrden.

18. **striata** (Giebel), 1848.

Syn. *Aulopora striata*, Giebel, 1848. Polyp. Plänerm. Quedl.: Zeit. Zool. Zoot. vol. i. p. 11.

Char.—Branches slender, multiserial; peristomes slightly elevated.

Distrib.—Senonian—Pläner mergel: Salzberg, near Quedlinburg.

INDETERMINABLE SPECIES.

A "basal outline of a fine colony." Vine, 1890: *op. cit.* p. 474.

On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll., No. 23. The specimen (B.M., **D. 2033**) is indeterminable.

FILISPARSA, d'Orbigny, 1853.

Synonyms.

Filisparsa, pars, d'Orbigny, 1853.
Hornera, pars, von Hagenow, 1851.

Diagnosis.

Diastoporidæ in which the zoarium consists of linear, ribbon-like branches, which are erect. The branches dichotomize and may anastomose. The base is expanded. Reverse side covered by epitheca.

Zoœcia open on one face only. The apertures are irregularly distributed.

TYPE SPECIES.

Filisparsa neocomiensis, d'Orbigny, 1853–4. Bry. Crét. p. 817, pl. 760, figs. 10–13. Neocomian: Baudrecourt, France.

AFFINITIES.

This unimportant genus may be regarded as a group of *Proboscinæ* with an erect habit. It is here retained solely on the ground of convenience; for examination of the series of 'species' assigned to the genus shows that it includes representatives of the principal types of *Proboscina*. Thus, *Filisparsa neocomiensis*, Orb., represents the type of *Proboscina alternata*, d'Orb.; *Filisparsa ramosa*, Orb., similarly represents the type of *Proboscina crassa* (Röm.). It appears, therefore, probable that the group of *Filisparsa* had a polygenetic origin. But as there is no definite proof of this idea, the group may be retained simply on the score of convenience. For, if *Filisparsa* be abandoned, of the five Cretaceous species founded by d'Orbigny, no less than three (viz., *F. crassa*, *F. alternata*, and *F. ramosa*) would have to be renamed, and possibly also the other two (*F. neocomiensis* and *F. reticulata*).

D'Orbigny placed *Filisparsa* in his family, the Sparsidæ, which was far too comprehensive to be retained. But *Filisparsa* was placed close beside *Stomatopora*, *Proboscina*, *Berenicea*, and *Diastopora*, in what seems to me its right position. Pergens has removed it to the Idmoniidæ. But I do not see any character in his diagnosis of his Diastoporidæ to exclude it from that group. By the irregular arrangement of its apertures, *Filisparsa* appears to belong to the same series as *Proboscina*, and not to *Idmonea* or *Crisina*.

Filisparsa reticulata, d'Orbigny.

SYNONYMY.

Filisparsa reticulata, d'Orbigny, 1853–4. Bry. Crét. p. 820, pl. 757, figs. 1–4.
,, ,, Pergens, 1890. Revision, p. 351.
,, *cenomana*, Canu, 1898. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 743, pl. xxii. figs. 3, 4.

DIAGNOSIS.

Zoarium reticulate; formed of flattened branches. The reverse face is slightly convex.

Apertures crowded; irregular in arrangement, but in places tending towards quincuncial. Peristomes well raised.

DIMENSIONS.

	Fide Pergens.	B.M., D. 4192.
Width of branch ...	— ...	1 mm.
Thickness of branch ...	— ...	·5 ,,
Diameter of zoœcia ...	·16–·18 mm. ...	·16–·2 ,,
Diameter of aperture ...	·08 ,, ...	·10 ,,

DISTRIBUTION.

BRITISH :

Middle Chalk : Chatham.

FOREIGN :

Turonian : Angoulême, Charente ; Saint-Maure, Indre-et-Loire ; Sougé and Trôot, Loir-et-Cher.

FIGURES.

Pl. III. Fig. 7. A fragment of a zoarium. Middle Chalk : Chatham. Fig. 7*a*, the obverse face, × 9 dia. ; Fig. 7*b*, part of the reverse face of the same, × 9 dia. Vine Coll. **D. 4192.**

AFFINITIES.

M. Canu has recently proposed a species *F. cenomana* which he describes as differing from *F. reticulata* in that "les tubes zoéciaux sont plus gros et plus saillants." He quotes two dimensions : the internal diameter of the aperture, which is ·11–·12 mm., varying therefore from 50 per cent. greater than in *F. reticulata* down to only 10 per cent. greater ; M. Canu quotes the diameter of the peristome as ·17 mm. In the specimen from Chatham here referred to *reticulata* the peristomes vary from ·16–·2 mm. in diameter.

D. 4192. Fragment of a zoarium which may have been reticulate. Upper Chalk. Chatham. Gamble Coll. Figd. Pl. III. Fig. 7.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **contortilis** (Lonsdale), 1845.

SYN. *Idmonea contortilis*, Lonsdale, 1845. Polyp. New Jersey : Quart. Journ. Geol. Soc. vol. i. p. 68.

Crisisina contortilis, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.

Idmonea contortilis, d'Orbigny, 1853. Bry. Crét. p. 729.

,, ,, Gabb, 1859. Cat. Cret. : Proc. Acad. Nat. Sci. Phil. 1859 [Appendix], p. 19.

,, ,, Gabb & Horn, 1862. Foss. Polyz. N. Amer. : Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 167.

Retepora, sp., Morton, 1834. Synops. Cret. p. 79.

CHAR.—Zoarium of anastomosing branches, which are flattened and rarely cylindrical. Apertures large; very irregular in distribution. Sometimes in transverse series. Reverse face slightly convex, furrowed.

DISTRIB.—Turonian: Timber Creek and Mullica Hill, New Jersey.

2. **crassa**, d'Orbigny, 1853.

SYN. *Filisparsa crassa*, d'Orbigny, 1853–4. Bry. Crét. p. 818, pl. 760, figs. 14–17.
,, ,, Pergens, 1890. Revision, p. 351.
Phormonotos crassus, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 34.

CHAR.—Zoarium thick; punctulate on obverse side, and ornamented on the reverse by longitudinal or lozenge-shaped lines. Apertures subquincuncial, in somewhat irregular lines.

DISTRIB.—Senonian: Rügen.
Rhodanian: Vassy, Haute-Marne.

3. **neocomiensis**, d'Orbigny, 1853.

SYN. *Filisparsa neocomiensis*, d'Orbigny, 1853–4. Bry. Crét. p. 817, pl. 760, figs. 10–13.
,, ,, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. mal. Belg. vol. xxi. p. 219.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 35.
,, ,, Pergens, 1890. Revision, p. 351.

CHAR.—Zoarium of narrow bands. A considerable portion of the distal ends of the zoœcia free. Apertures distant. Peristomes long and free.

DISTRIB.—Danian: Faxoe.
Senonian: Rügen.
Neocomian: Baudrecourt, Haut-Marne.

4. ? **ornata**, von Reuss, 1874.

SYN. *Filisparsa ornata*, von Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 134, pl. xxiv. fig. 19.

CHAR.—Surface ribbed, apertures irregular (von Reuss, p. 134). Reverse face concave; but without more knowledge of the reverse side the species cannot be generically placed.

DISTRIB.—Turonian: Strehlen and Weinböhla, Saxony, in Upper Pläner.

5. **ramosa**, d'Orbigny, 1853.

Syn. *Filisparsa ramosa*, d'Orbigny, 1853–4. Bry. Crét. p. 819, pl. 756, figs. 18–22.
,, ,, Pergens, 1890. Revision, p. 351.

Char.—Zoarium of thick, ribbon-shaped branches. Reverse surface smooth; margins rounded. Obverse studded by large apertures, which are irregularly scattered.

Distrib.—Senonian—Maastrichtian: Fécamp, Seine-Inférieure; Meudon; Ste. Colombe, Manche.
Coniacian: Ste. Maure, Indre-et-Loire; Vendôme, Loir-et-Cher.
Turonian: Lavardin and Villavard, Loir-et-Cher; St. Germain, near La Fleche, Sarthe.

6. ? **steenstrupi** (Perg. & Meun.), 1886.

Syn. *Hornera steenstrupi*, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. mal. Belg. vol. xxi. p. 218, pl. xiii. figs. 2–4.

Char.—Subcylindrical branches. Zoœcia large and short; fusiform or subangular. Apertures in old parts of the colony tending to occur in transverse series. Epitheca on reverse side very thin or rudimentary.

Distrib.—Danian: Faxoe.

7. **tubulifera** (von Hagenow), 1851.

Syn. *Hornera tubulifera*, von Hagenow, 1851. Bry. Maastr. Kr. p. 26, pl. ii. fig. 1.
,, ,, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. mal. Belge, vol. xxi. p. 218.
Filisparsa ,, d'Orbigny, 1854. Bry. Crét. p. 816.
,, ,, Staring, 1860. Bodem Nederl. vol. ii. p. 402.
,, ,, Hamm, 1881. Bry. mastr. Ober-Sen. p. 28.
Entalophora beisseli, Ubaghs, 1865. Bry. Maastr.: Verh. nat. ver. preuss. Rheinl. vol. xxii. p. 59, pl. iii. fig. 9.

Char.—Anastomosing, irregular branches, round on reverse and sharper on the obverse side. Zoœcia irregular, with distant, well raised peristomes. About four zoœcia in the width of the zoarium.

Distrib.—Danian: Faxoe.
Senonian: Maastricht.

BERENICEA (Lamouroux), 1821.

SYNONYMS.

Aulopora, pars, Goldfuss, 1829; Römer, 1839, etc.
Stomatopora, pars, Bronn, 1848.
Cellepora, pars, von Hagenow, 1839.
Diastopora, pars, Milne Edwards, 1838, etc.
Rosacilla, Römer, 1840.
Tubulipora, pars, von Reuss, 1847, etc.
Dacryopora, Terquem, 1855.

DIAGNOSIS.

Diastoporidæ in which the zoarium is a thin, unilaminar, encrusting sheet. The zoœcia are tubular. The peristome is usually slightly raised; but the aperture is often flush with the surface of the zoarium.

The marsupial expansion is usually a gonocyst.

TYPE SPECIES.

Berenicea prominens, Lamx. Recent: Mediterranean. [The *B. obelia* (Johnst.).]

CRETACEOUS REPRESENTATIVES.

Berenicea is a very common Cretaceous Bryozoan, and one of the most difficult genera to divide into satisfactory subdivisions. The variations are less numerous than among the Jurassic forms of the genus. Some of the Cretaceous species show a decided advance on their Jurassic predecessors; the bottle-shaped zoœcia of *B. folium*, Nov., are, for example, more specialized than those of any Jurassic *Berenicea*. The peristomes are often higher and more isolated than in the earlier members of the genus, and thus approximate to *Phalangella*, of which the most primitive form appears to be a Cretaceous species originally referred to *Berenicea*, viz., *B. radians*, Nov.

The species of *Berenicea* have been referred to *Aulopora*, *Cellepora*, *Tubulipora*, and *Stomatopora*, from which all bryozoologists now agree in separating them. *Rosacilla* was proposed by Römer[1] in 1840, and is inevitably a synonym of *Berenicea*, unless the recent and Cretaceous species be worthy of generic separation. *Dacryopora* has been used by Terquem[1] for *B. archiaci.*

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[1] Römer: Verst. nordd. Kreidegeb. pt. i. 1840, p. 19.

The retention of this genus has been criticized by M. Canu, who includes it in *Diastopora*; but M. Canu accepts *Proboscina*, which appears to me less distinct from *Berenicea* than the latter is from *Diastopora.* M. Canu[2] has also criticized the grouping of the Jurassic specimens into 'species,' and proposed a different arrangement based on the dimensions of the constituent elements of the zoarium. M. Pergens[3] in 1895 advocated the use of dimensions for the identification of Bryozoa, and has quoted dimensions extensively in his valuable "Revision." That equivalent zoœcia in zoaria belonging to different species often differ in size is undoubted. But equivalent zoœcia in different species, according to M. Pergens' own measurements, are often of the same size. Difference of size in the zoœcia does not appear to be necessarily a specific distinction, but to be due to the conditions of growth. It is, of course, possible, by the adoption of artificial averages, to divide specimens of *Berenicea* into groups characterized by different dimensions; but such groups do not appear natural or satisfactory.

An attempt was made in the Catalogue of Jurassic Bryozoa to compare the principal characters of equivalent zoœcia in different species by the use of formulæ; but the variability of zoœcial dimensions is so great that even such a generalized use of dimensions appears too difficult to yield useful results, and is accordingly discontinued. In the present volume actual dimensions are given in the hope that they will save trouble to those students of the Bryozoa who prefer to classify the species according to the size of the zoœcia. On that system the specimens grouped together as *Berenicea papyracea*, for example, will have to be separated, owing to the differences in size stated on p. 77.

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[1] Terquem, 1855. Pal. dép. Moselle, p. 26 (of separate copies); and 1868, in Jacquot, Description geól. dép. Moselle, pp. 290, 296.

[2] Canu. Ovicelles Bry. Bathonien: Bull. Soc. geól. France, ser. 3, vol. xxvi. 1898, pp. 265–280.

[3] Pergens. Note sur l'identification et la séparation des espèces dans le groupe des Bryozoaires: Bull. Soc. belge Geól. vol. ix., Proc. verb. 1895, pp. 8–11.

1. **Berenicea gracilis** (Edwards), 1838.

SYNONYMY.

Diastopora gracilis, M. Edwards, 1838. Mém. Cris.: Ann. Sci. nat. Zool. ser. 2, vol. ix. pp. 237, 229–230, pl. xiv. fig. 3.
non ,, ,, Michelin, 1840. Icon. Zooph. p. 5, pl. i. fig. 9.
,, ,, von Reuss, 1846. Verst. böhm. Kr. p. 65, pl. xiv. fig. 33.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
non ,, ,, d'Orbigny, 1851. Bry. Crét. pl. 635, figs. 6–9.
,, ,, Pergens, 1890. Revision, p. 334, pl. xi. fig. 4.
Berenicea ,, d'Orbigny, 1854. Bry. Crét. p. 864.
? *Aulopora flabelliformis*, Römer, 1839. Verst. nordd. Ool. Geb., App. p. 15, pl. xvii. fig. 4.
? *Rosacilla* ,, Römer, 1840. Verst. nordd. Kr. Geb. p. 19.
? *Diastopora* ,, *pars*, von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
? *Berenicea* ,, d'Orbigny, 1854. Bry. Crét. p. 861.
Diastopora, sp., Lonsdale, 1849. Zooph. Atherf.: Quart. Journ. Geol. Soc. vol. v. p. 102.
,, *diluviana* (*non* Edw.), von Reuss, 1846. Verst. böhm. Kr. p. 65, pl. xiv. fig. 14.
,, *vassiacensis*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 109.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 635, figs. 12, 13.
,, *intermedia*, d'Orbigny, 1851. *Ibid.* pl. 635, figs. 10, 11.
Berenicea tenuis (*non* d'Orb.), von Reuss, 1854. Kreidesch. Ostalp.: Denk. Akad. Wiss. Wien. vol. vii. p. 136, pl. xxvii. fig. 9.

DIAGNOSIS.

Zoarium irregular, lobed or subcircular, often of two flabelliform branches.

Zoœcia cylindrical, long. The zoœcia are usually visible throughout, but are sometimes crowded at the margin. The walls of the zoœcia are smooth, or minutely granulate or faintly wrinkled.

Peristomes low. The apertures of the zoœcia are irregularly distributed.

Gonocysts elliptical; the transverse width is twice as great as the radial width.

DIMENSIONS.

	B.M. D.3118.	B.M. 46,802.	B.M. D.382.	B.M. D.3912.	From M. Edwards' figure.	D'Orbigny's type (*fide* Pergens).
	mm.	mm.	mm.	mm.	mm.	mm.
Length of zoœcia ...	·6–·65	·8–1·3	·8	·5–·6	·5	·5 + x
Diameter of zoœcia...	·1–·13	·2	·2	·11–·14	·1	·18
Diameter of aperture	·05	·12	·12	·07	·06	·06–·07

DISTRIBUTION.

ENGLAND:
Upper Chalk: Charlton.
Middle Chalk: Chatham.
Lower Greensand—Atherfield Clay: Isle of Wight.

FOREIGN:
Senonian—Maastrichtian: Meudon.
Campanian: Rügen.
Turonian: Nefgraben, near Gosau; Handorf, Bohemia, in Upper Pläner (Scaphitenkalk).
Cenomanian: Schillinge, near Bilin, in Lower Pläner.
Rhodanian: Vassy, Haute-Marne; Auxerre, Yonne.
Neocomian: Saint-Croix, Vaud; ? Schöppenstadt, Hannover, in Hilsconglomerat.

FIGURES.

Pl. V. Fig. 1. Part of a large zoarium encrusting a stem of *Choristopetalum impar*, Londs.; × 8 dia. Lower Greensand: Atherfield, Isle of Wight. Morris Coll. **46,802.**

Pl. IV. Fig. 5. A zoarium of var. *tenuis* (Rss.). Middle Chalk: Chatham. Fig. 5*a*, the whole zoarium, natural size; Fig. 5*b*, part of the zoarium, × 12 dia. Gamble Coll. **D. 382.**

Pl. IV. Fig. 6. A zoarium of var. *tenuis* (Rss.). Upper Chalk: Charlton. Fig. 6*a*, the zoarium, natural size; Fig. 6*b*, part of the zoarium, × 10 dia. Presented by G. C. Crick, Esq. **D. 3002.**

AFFINITIES.

This 'species' was founded by Milne Edwards on a specimen from the Rhodanian of Vassy, in the département of Haute-Marne. In the type the zoœcia are well spaced and long; the apertures are distant, except at the margin of the zoarium, which is flabelliform and irregular. D'Orbigny originally founded two species, *Diastopora vassiacensis* and *D. intermedia*, both of which he subsequently merged in *B. gracilis*. A third synonym for Lower Cretaceous specimens was made by Römer, whose *Aulopora flabelliformis* from the German Hilsconglomerat has the elongate zoœcia of the typical Lower Cretaceous form. Römer's figure probably exaggerates the elongation; but if his figure be correct his species should perhaps be regarded as identical with d'Orbigny's *B. papyracea*, which name it would replace.

The 'species' was extended to include Upper Cretaceous Bryozoa by von Reuss, who included in it some specimens from the Upper and Lower Pläner of Bohemia. In 1872 the same author described his 1846 figure as "*ic. mala*," and included it in the synonyms of *B. grandis* (Orb.), a proposal of doubtful value. Von Reuss' *B. tenuis* (*non* Orb.) may be regarded as an Upper Cretaceous representative of *B. gracilis*; its main distinction is the somewhat smaller length of the zoœcia. A typical Lower Greensand specimen and a representative of the var. *tenuis* are shown on Pl. V. Fig. 1 and Pl. IV. Fig. 6 respectively. The differences between them appear at first sight sufficient to make *B. tenuis* distinct; but the differences in dimensions are inconstant and do not admit of definite numerical expression. That *B. tenuis* is not even a mutation, is shown by the fact that among the British specimens an Upper Chalk form is nearest in dimensions to Milne Edwards' type.

B. gracilis is a very typical member of the genus, and appears to be the Cretaceous representative of the type species *B. diluviana*, Lamx.[1] The close resemblance between them has been already pointed out in the Catalogue of Jurassic Bryozoa.

Among Cretaceous species its nearest ally is *B. papyracea* (Orb.), which has much longer zoœcia, though no sharp numerical separation can be drawn between them.

The nearest Jurassic ally of this 'species' is *B. diluviana*, Lamx.; the differences between them were referred to in the Cat. Jur. Bry. (p. 93), and in addition to those there noticed may be added the fact that in *B. gracilis* the zoœcia are not so crowded on the margins of the zoarium. The specimen figured on Pl. V. Fig. 2 is a young zoarium on a *Zeilleria*, which was labelled as a *T. faba* from the Lower Greensand; the specimen was then figured to show how close the resemblance is between the young of *B. gracilis* and of *B. diluviana*. On re-examination of the specimen its affinities to the Jurassic species seemed so close that I asked Mr. R. B. Newton to redetermine the *Zeilleria*; he recognized it as no doubt a specimen of the Cornbrash *Z. obovata*. Hence there can be no doubt that the specimen is Jurassic, and had been erroneously included in the Cretaceous series.

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[1] Cat. Jur. Bry. pp. 89–94, pl. iv. figs. 4, 6.

Among Cainozoic 'species' of *Berenicea*, *B. gracilis* presents most resemblance to *B. sparsa* (Rss.) from the Hungarian Miocene; the two forms differ by the greater elevation of the peristomes in *B. sparsa* (Rss.).[1]

LIST OF SPECIMENS.

46,802. A zoarium encrusting a stem of *Choristopetalum impar*, Lonsd. Lower Greensand. Isle of Wight. Morris Coll. Recorded as *Diastopora*, sp., Lonsdale: Quart. Journ. Geol. Soc. vol. v. p. 102. Figd. Pl. V. Fig. 1.

D. 3002. A zoarium of var. *tenuis* (Rss.), encrusting a fragment of *Echinocorys scutatus*. Upper Chalk. Charlton. Presented by G. C. Crick, Esq. Figd. Pl. IV. Fig. 6.

D. 382. A slightly worn zoarium of var. *tenuis* (Rss.). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. IV. Fig. 5.

D. 3897. An irregular, worn zoarium of var. *tenuis* (Rss.), encrusting an *Inoceramus* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4267. A zoarium of var. *tenuis* (Rss.) on an echinid plate; on a slide with specimens of *B. papillosa* (Rss.). Middle Chalk. Chatham. Gamble Coll.

D. 3118. A zoarium of var. *tenuis* (Rss.), encrusting an echinid fragment (on slide). Upper Chalk. Charlton. Presented by G. C. Crick, Esq.

D. 3891. A zoarium of var. *tenuis* (Rss.), encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3892. A zoarium of var. *tenuis* (Rss.), encrusting a shell fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3912. A zoarium of var. *tenuis* (Rss.), encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3888. A zoarium of var. *tenuis* (Rss.), with *Reptomultisparsa rowei*, Greg., and *Hippothoa*, sp., encrusting a broken *Inoceramus*. Middle Chalk. Chatham. Gamble Coll.

D. 5156. A young zoarium with *B. papillosa* (Rss.), on fragments of *Inoceramus*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3895. A zoarium of var. *tenuis* (Rss.), encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3893. A crescentic zoarium of var. *tenuis* (Rss.), encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3904. Four zoaria of var. *tenuis* (Rss.), encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3906. A zoarium of var. *tenuis* (Rss.), encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

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[1] Von Reuss. Foss. Polyp. Wien. Tert: Naturw. Abh. vol. ii. p. 51, pl. vii. fig. 10.

2. Berenicea papyracea (d'Orbigny), 1851.

SYNONYMY.

Diastopora papyracea, d'Orbigny, 1851. Bry. Crét. pl. 641, figs. 3, 4.
non ,, ,, d'Orbigny, 1853–4. *Ibid.* p. 830, pl. 758, figs. 14–16.
,, ,, Pergens, 1890. Revision, p. 335, pl. xi. fig. 10.
Berenicea ,, d'Orbigny, 1854. Bry. Crét. p. 868.
,, ,, Peron, 1888. Craie Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. p. 225.
? *Berenicea comata*, von Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 132, pl. xxv. fig. 4.

DIAGNOSIS.

Zoarium irregular, flabelliform, thin.

Zoœcia very long and sinuous; sometimes slightly expanded at the distal end. Apertures irregularly distributed and sparsely scattered.

Gonœcium piriform; four times as wide as the zoœcia.

DIMENSIONS.

	Fide Pergens.	B.M., D. 3884.
Distance of apertures in same longitudinal series	·5–·6 mm.	1·3–2·0 mm.
Diameter of zoœcia	·1 ,,	·25 ,,
Diameter of apertures	·03 ,,	·13 ,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:
Senonian—Maastrichtian: Meudon.
Campanian: Reims, in zone of *Micraster fastigiatus*.
Santonian: Sudmerberg, Brunswick.
Turonian: Strehlen, Saxony, in Upper Pläner.

FIGURES.

Pl. IV. Fig. 7*a*, the zoarium, nat. size. Fig. 7*b*, part of the same, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3884.**

Fig. 2, p. 78. Part of a zoarium with gonœcium, × 10 dia. Ober Kreide: Sudmerberg. **D. 5154.**

AFFINITIES.

Berenicea papyracea (Orb.) is allied to *B. gracilis*, from which it differs by the greater length and more sinuous course of the zoœcia. The dimensions of d'Orbigny's type of *B. papyracea* given by M. Pergens are practically identical with those of Milne Edwards' figure of *B. gracilis*, which are quoted in the table of dimensions on p. 73; while the specimens from Chatham here referred to *B. papyracea* agree closely with the Lower Greensand specimen (**46,802**) figured as a *B. gracilis*, in which the proportions are identical with those of the type of *B. gracilis*, only the zoœcia are twice as large. The difficulty of using dimensions is illustrated by this species: thus the dimensions recorded by M. Pergens are quoted in the first column:

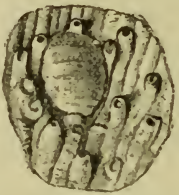

Fig. 2.—*Berenicea papyracea* (Orb.); part of a zoarium with a gonœcium, × 10 dia. Ober Kreide: Marsupite zone. Sudmerberg, Brunswick. Saemann Coll. **D. 5154.**

	Pergens, p. 335.	Pergens, pl. xi. fig. 10.
Transverse zoœcial diameter	·1 mm.	·08 mm.
Aperture [orifice]	·03 ,,	·04 ,,
"La distance"	·5–·6 ,,	·2–1·08 ,,

But Pergens' figure of the species on pl. xi. fig. 10 is said to be magnified 14 diameters: estimated from that figure the same three characters have the dimensions given in the second column; the diameter of the aperture is half the diameter and not less than a third, while the length of the zoœcia varies from two-fifths to almost eleven-sixths of M. Pergens' estimate.

B. papyracea, by its long and sinuous zoœcia, resembles the Jurassic *B. parvitubulata*, Greg.,[1] but the zoœcia are much thicker than in that Bathonian 'species.'

By the great separation of the apertures this 'species' resembles the Pliocene *B. simplex* (Busk),[2] in which the zoarium is thicker and more wrinkled. In the living *B. suborbicularis* (Hincks)[3] the zoœcia are also very elongate, but they are not immersed in a wrinkled zoarium, and they are punctate. The *Berenicea comata* of von Reuss is crushed, and thus cannot be definitely determined from the figure; by the great length of the zoœcia and their sinuous course it agrees with *B. papyracea*, but it has points which suggest an affinity to *B. folium*.

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[1] Cat. Jur. Bry. p. 95, pl. iv. figs. 5, 6.

[2] *Diastopora simplex*, Busk. Crag Polyz. p. 113, pl. xx. fig. 10.

[3] Hincks. Brit. Mar. Polyz. p. 464, pl. lxvi. figs. 11, 11*a*: the name was proposed to replace *B. simplex* (Busk).

LIST OF SPECIMENS.

British.

D. 3884. A zoarium encrusting a fragment of *Inoceramus* (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. IV. Figs. 7*a*, *b*.

Foreign.

D. 3711. Three large zoaria and one small one. Ober Kreide: Marsupite zone. Sudmerberg, Brunswick. L. Saemann Coll.

D. 5154. A zoarium with gonœcium. Ober Kreide: Marsupite zone. Sudmerberg, Brunswick. L. Saemann Coll. Figd. p. 78, Fig. 2.

3. **Berenicea phlyctænosa**, von Reuss, 1854.

Synonymy.

Berenicea phlyctænosa, von Reuss, 1854. Kreidesch. Ostalp.: Denk. Akad. Wiss. Wien, vol. vii. p. 136, pl. xxvii. fig. 10.

Diagnosis.

Zoarium irregular in form, thin.

Zoœcia mainly immersed in the zoarium, from which the peristomes rise abruptly. The peristomes are well raised, usually circular, but sometimes subelliptical, large, and irregularly scattered; as a rule the apertures are at a medium distance apart, but in places they are at a considerable distance.

Gonocysts small, irregular, and generally elongated at right angles to the zoœcia.

Dimensions.

	B.M., D. 3000.
Distance of apertures in same longitudinal series	·3–·5 mm.
Diameter of zoœcia	·15–·2 ,,
Diameter of apertures...	·1–·13 ,,

Distribution.

England:

Upper Chalk: Charlton.

Zone of *Micraster coranguinum*: Quidhampton, near Salisbury.

Middle Chalk: Chatham.

Foreign:

Senonian—Maastrichtian: Maastricht.

Santonian—Marsupitenkreide: Sudmerberg, Brunswick.

Turonian: Nefgraben, near Gosau; St. Rimay, Loir-et-Cher, in Craie marneuse.

Figures.

Pl. VI. Fig. 4. Part of a zoarium, where the zoœcia are not very distant and are uniform in distribution; elsewhere the peristomes are more distant and the zoœcia flabelliform ; × 10 dia. Upper Chalk: Charlton. Presented by G. C. Crick, Esq. **D. 3000.**

Fig. 3. Part of a zoarium showing a broken gonocyst, with three zoœcia opening into it; × 15 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 3574.**

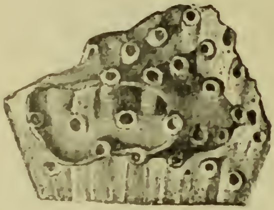

Fig. 3.—*Berenicea phlyctænosa*, Rss.; part of a zoarium with a broken gonocyst, × 15 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 3574.**

Affinities.

Berenicea phlyctænosa was founded by von Reuss for a specimen from the Turonian of Gosau. Its nearest ally is probably *B. gracilis*, var. *tenuis*, from which it differs by the zoœcia and apertures being larger in proportion to the length of the zoœcia. The zoarium is thicker, and the zoœcia mainly immersed, apertures standing out above the surface like small scattered beads. The species also presents points of resemblance to *B. regularis*, var. *gamblei*, owing to the large diameter of the zoœcia; but the zoarium is flatter, and the peristomes are less elevated and more regular in arrangement. The zoœcial diameter is the same as in *B. regularis*, var. *ambita*; but there is no bare selvage, and the peristomes are larger.

LIST OF SPECIMENS.

British.

D. 3000. A zoarium encrusting a fragment of *Echinocorys scutatus*. Upper Chalk. Charlton. Presented by G. C. Crick, Esq. Figd. Pl. VI. Fig. 4.

D. 3249. A small zoarium encrusting a fragment of *Echinocorys*, with *Stomatopora gracilis* (Edw.). Upper Chalk: *Micraster coranguinum* zone. Quidhampton, near Salisbury. Presented by Dr. H. P. Blackmore.

D. 3902. A thin zoarium with irregular outline, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3905. A zoarium with irregularly elliptical form, encrusting an echinid plate (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2690. A large zoarium with broken gonocyst, encrusting an echinid plate (on slide). Middle Chalk. Chatham. Vine Coll.

FOREIGN.

D. 3574. A large zoarium encrusting a reticulate *Retecava* sp., with gonocyst (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll. Figd. Fig. 3.

D. 3710. A large zoarium encrusting *Chonella tenuis*. Ober Kreide: Marsupite zone. Sudmerberg, Brunswick. L. Saemann Coll.

D. 4594. An irregular zoarium growing round a bryozoan stem. Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

4. **Berenicea papillosa** (von Reuss), 1846.

SYNONYMY.

Diastopora papillosa, von Reuss, 1846. Verst. böhm. Kr. p. 65, pl. xv. figs. 44, 45.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
,, ,, *pars*, Pergens, 1890. Revision, p. 334, pl. xii. fig. 1.
? ,, ,, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 477.
,, ,, Bucaille, 1890. Bry. Crét. Seine Infér.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 509.
,, ,, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 380.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 203.
,, ,, Vine, 1893. Rep. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 308, Nos. 16, 17.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. Proc. verb. p. 132.
Berenicea papillosa, d'Orbigny, 1854. Bry. Crét. p. 866.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 402.
? *Flustra tubulosa*, Woodward, 1833. Geol. Norf. p. 46, pl. iv. fig. 5.
Diastopora pusilla, von Reuss, 1846. *Op. cit.* p. 65, pl. xiv. fig. 15.
,, ,, von Hagenow, 1850. *Op. cit.* p. 234.
? ,, *diluviana*, d'Archiac, 1846. Crét. vers. Plat. centr.: Mém. Soc. géol. France, ser. 2, vol. ii. No. 1, p. 79.
,, *oceanica*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 266.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 639, figs. 6, 7.
,, *grandis*, d'Orbigny, 1851. *Ibid.* pl. 639, figs. 4, 5.
,, ,, *pars*, Pergens, 1890. Revision, p. 335.
,, ,, Vine, 1893. Rep. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 308.
Berenicea ,, d'Orbigny, 1854. Bry. Crét. p. 866.
non ,, ,, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 109, pl. xxvi. fig. 10.
non ,, ,, von Reuss, 1874. Bry. ob. Plän.: *ibid.* vol. xx. pt. 2, p. 131.
,, ,, Peron, 1888. Craie Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. pp. 184, 225, 264.

Diastopora echinata, d'Orbigny, 1851. Bry. Crét. pl. 641, figs. 1, 2.
,, *papillosa, forma echinata*, Vine, 1893. Rep. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 308.
Berenicea echinata, d'Orbigny, 1854. Bry. Crét. p. 868.
,, ,, Brauns, 1875. Sen. Salzberg: Zeit. ges. Naturw. vol. xlvi. p. 401.
Berenicea hagenowi, von Reuss, 1854. Kr. Schicht. Ostalp.: Denk. Akad. Wiss. Wien. vol. vii. p. 136, pl. xxviii. fig. 6.
non ,, ,, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 109, pl. xxvi. fig. 12.
non Diastopora hagenowi, Vine, 1889. Greensd. Polyz.: Proc. Yorks. Geol. Soc. vol. xi. p. 266, pl. xii. fig. 9.
Diastopora disciformis, pars, Hamm, 1881. Bry. mastr. Ober-Sen. p. 25.

DIAGNOSIS.

Zoarium circular, elliptical, or somewhat irregular; thin, but often large.

Zoœcia cylindrical, very crowded. In young zoaria the zoœcia are visible throughout, but in adult forms they are immersed, except at the distal end. The walls are plain.

Apertures arranged in linear series, or quincuncial, or locally irregular.

Peristomes slightly raised (form *oceanica*), or the distal end may be reflexed and well raised (form *papillosa*).

Gonocysts large and irregular; usually in long ridges, transverse to the zoœcia; there may be several concentric series.

DIMENSIONS.

	Fide Pergens.		B.M., 24,887.
Distance of apertures in same longitudinal series ...	—	...	·3–·9 mm.
Diameter of zoœcia	·14–·16 mm.	...	·2–·3 ,,
Diameter of apertures ...	·04–·06 ,,	...	·15–·2 ,,

DISTRIBUTION.

BRITISH:
Upper Chalk: Norwich, Charlton, Bromley.
Middle Chalk: Chatham.
Lower Chalk: Folkestone.

FOREIGN:
Danian: Faxoe.
Senonian—Maastrichtian: Fécamp and Dieppe, Seine-Inférieure; Meudon, near Paris; Ste. Colombe, Manche, in Craie à baculites; Mons and Maastricht (*fide* Staring).
Campanian: Reims, Marne, in zone of *Micraster fastigiatus*.

Santonian: Arche de Lèves, near Chartres; St. Paterne, Loir-et-Cher, in zone of *Spondylus truncatus*; Saintes and Royan, Charente-Inférieure; Salzberg, near Quedlinburg, Brunswick.

Coniacian: Tours, Joué, Luynes, Maune, and Ste. Christophe, Indre-et-Loire; Vendôme and Lisle, Loir-et-Cher, in Craie de Villedieu.

Turonian—Angoumian: Merpins, Charente; Montoire, Villardin, and Villavard, Loir-et-Cher, in Craie marneuse; St. Germain d'Arcé, Sarthe; Nefgraben, near Gosau; Villecien, Yonne, in zone of *Micraster breviporus*.

Cenomanian: Kamajk and Zbislav, Bohemia, in Korycaner Schichten; Cap de la Hève and Lisores, in Craie glauconieuse.

FIGURES.

Pl. V. Fig. 6. A zoarium with circular series of gonocysts; × 3 dia. Middle Chalk: Chatham. Vine Coll. **D. 2614.**

Pl. V. Fig. 7. A zoarium. Upper Chalk: Norwich. Fig. 7*a*, part of zoarium with gonocyst; × 16 dia. Fig. 7*b*, part of the margin of the same specimen with a young zoarium; × 10 dia. Bayfield Coll. **24,887.**

Pl. V. Fig. 8. A broken gonocyst, showing the intra-gonocystal apertures of several zooecia; × 22 dia. Middle Chalk: Chatham. Vine Coll. **D. 2982.**

Pl. V. Fig. 9. Part of a very thin zoarium, encrusting an echinid fragment, and showing papilliform elevations over the tubercles; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3917.**

AFFINITIES.

Berenicea papillosa was founded by von Reuss in 1846 for a Cenomanian specimen, of which his figures give but an imperfect idea. All recent palæontologists who have described the species accept it for a Senonian form, which is certainly closely allied to the original type, but which is possibly not identical with it. However, without an opportunity for the examination of von Reuss' type it is impossible to be certain of its exact affinities, and thus it seems advisable to accept the current interpretation of the species.

It may therefore be taken as characterized by its discoid zoarium and crowded zoœcia, of which the apertures are distributed with considerable regularity, either quincuncially or on long, curved, regular lines. The peristomes are usually well raised and sharply reflexed, as shown in von Reuss' figure; but in d'Orbigny's *D. oceanica,* which is always treated as a synonym of *B. papillosa,* the peristomes are low and almost flush with the surface of the zoarium. When referring to *B. papillosa* in the Catalogue of Jurassic Bryozoa, a doubt was expressed whether d'Orbigny's *oceanica* is really the same as von Reuss' typical *B. papillosa*; and I still feel uncertain upon that point. D'Orbigny's *D. oceanica* is a near ally of the *Berenicea hagenowi* of von Reuss, 1854 (*non* 1872), which has zoœcia like those of *B. papillosa,* but the apertures more sparsely scattered, and therefore approximating to *B. disciformis,* Hag. The specimens referred by von Reuss in 1872 to this species differ materially from those on which he founded it in 1854. Zoaria that differ from the type form in the direction opposite to that of the *oceanica* series may be referred to the var. *echinata* (Orb.), in which the peristomes are crowded and highly raised; as M. Pergens expresses it, "*B. echinata* est *B. papillosa* plus serreé."

The varieties *oceanica* and *echinata* seem such individual variations of *B. papillosa* that it is useless to define them; but *B. hagenowi* is more distinct, and is therefore noticed separately as a definite variety.

The principal synonyms of *B. papillosa* are *B. echinata* (Orb.) and *B. oceanica* (Orb.), which may be included as varieties; *B. pusilla,* Rss., appears to be the same species, but the peristomes are lower. The *Flustra tubulosa* of Woodward's "Geology of Norfolk" is no doubt the same as this 'species'; but his figure represents the apertures as too distant, an aspect probably due to an error in the drawing, which is so crude that Woodward's name has no right to stand, in spite of its priority.

Another 'species' of d'Orbigny which should probably be included in *B. papillosa* is his *Diastopora grandis,* which appears to be only a *B. papillosa* in which gonocysts are present, but are represented in the figure as flat areas bare of apertures. M. Pergens keeps *B. grandis* distinct, although he quotes its dimensions as practically identical with those of *B. papillosa.*

Among Cretaceous *Bereniceæ* its nearest allies are *B. polystoma* (Röm.), which has a much thicker zoarium and less regularly arranged apertures; and *B. disciformis,* in which the apertures are more widely spaced. It differs from *B. phlyctænosa* by having more crowded and more slender zoœcia, and from

B. gracilis and *B. papyracea* by the greater proportional shortness of the zoœcia.

Young forms of *B. papillosa* resemble *B. polystoma* (Röm.), but the zoœcia are less raised, and the resemblance is lost before the zoaria are mature. Young specimens also resemble those of corresponding age in *B. disciformis*, Hag., in which the zoarium is much thicker. Hamm,[1] it may be remarked makes *B. papillosa* (Rss.) a synonym of *B. disciformis*, but the two species seem quite distinct.

The Jurassic representative of *B. papillosa* is *B. scobinula* (Mich.),[2] which has larger zoaria and less elevated peristomes.

B. papillosa also resembles the Jurassic *B. archiaci*, Haime, in the shape of its gonocysts, which sometimes occur in irregular circular bands, as shown in a specimen figured in Cat. Jur. Bry. pl. iv. fig. 1. In zoaria of *B. archiaci*, with scattered gonocysts there is a similar patchy arrangement of the apertures as in the *B. papillosa*, var. *grandis* (Orb.). *B. archiaci* differs, however, from *B. papillosa* by having the apertures less regular in distribution and more crowded on the margin.

Berenicea minima, from the Leithakalk near Vienna is probably the nearest Cainozoic representative of this species; the gonocysts are not shown in von Reuss's[3] figure, and the peristomes are more regularly distributed than in the Cretaceous form.

4a. **Berenicea papillosa** (Rss.), var. **hagenowi**,

von Reuss, 1854.

SYNONYMY.

Berenicea hagenowi, von Reuss, 1854. Kreidesch. Ostalp.: Denk. Akad. Wiss. Wien. vol. vii. p. 136, pl. xxviii. fig. 6.

non ,, ,, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 109, pl. xxvi. fig. 12.

non Diastopora hagenowi, Vine, 1889. Greensd. Polyz.: Proc. Yorks. Geol. Soc. vol. xi. p. 266, pl. xii. fig. 9.

VARIETAL CHARACTERS.

Zoarium with lower peristomes, which are more widely and less regularly spaced than in the typical form.

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[1] Hamm: Bry. mastr. Ober-Sen. 1881, p. 25.

[2] Cat. Jur. Bry. pp. 106–8, pl. v. fig. 3.

[3] Von Reuss. Foss. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. p. 51, pl. vii. fig. 7.

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:
Turonian: Gosau.
Cenomanian: Cap de la Hève.

AFFINITIES.

This variety should perhaps be called var. *oceanica*, as it may be the same as that which d'Orbigny figured as a distinct species under that name. Von Reuss's figure, however, appears more distinctive and reliable, and his name is therefore accepted. The variety differs from the normal form by its lower, more distant peristomes, which are, however, much closer than in *B. disciformis* (Hag.). I at first regarded the specimens now included in this variety as only crowded forms of *B. disciformis*; but the zoœcia are smaller and shorter.

LIST OF SPECIMENS OF THE SPECIES.

BRITISH.

D. 2614. A zoarium with a circular series of gonocysts. Middle Chalk. Chatham. Vine Coll. Figd. Pl. V. Fig. 6.

24,887. A large zoarium, with three young zoaria, encrusting *Echinocorys scutatus*. Upper Chalk. Norwich. Bayfield Coll. Figd. Pl. V. Figs. 7*a*, *b*.

D. 2982. A zoarium, with broken gonocysts, encrusting a fragment of *Echinocorys*. Middle Chalk. Chatham. Vine Coll. Figd. Pl. V. Fig. 8.

D. 3917. A zoarium on an echinid fragment. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. V. Fig. 9.

D. 3834. Two zoaria, encrusting a sponge fragment, with *Stomatopora gracilis* (Edw.) and *Proboscina cornucopiæ* (Orb.). Middle Chalk. Chatham. Gamble Coll.

D. 959. A large irregular zoarium on an echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Diastopora grandis*, Orb., by Vine, 1893: Rep. Brit. Assoc. 1892, p. 308, No. 18.

D. 962. A zoarium of var. *echinata*, with the zoarial centre of growth excentric in position (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Diastopora papillosa* (Rss.) by Vine, 1892: *op. cit.* p. 308, No. 16.

D. 492. Several young zoaria, encrusting a broken *Echinocorys*, sp.; in the largest zoarium some of the zoœcia are well reflexed, while in other zoœcia the peristomes are low. Middle Chalk. Chatham. Gamble Coll.

D. 2986. A large regular zoarium, encrusting a fragment of *Echinocorys.* Middle Chalk. Chatham. Presented by Wm. Gamble, Esq., 1889.

D. 3889. Zoaria of different ages, encrusting a broken *Echinocorys.* Middle Chalk. Chatham. Gamble Coll.

D. 4156. Five young zoaria, encrusting *Echinocorys scutatus.* Middle Chalk. Chatham. Gamble Coll.

D. 4166. A large irregular zoarium covering 20 mm. of a stem of *Desmeopora semicylindrica* (Röm.). Middle Chalk. Chatham. Gamble Coll.

D. 4340. A zoarium of var. *echinata.* Middle Chalk. Chatham. Gamble Coll.

D. 4267. A large irregular zoarium and a medium-sized regular specimen on echinid fragments ; Nos. 1 and 2 on a slide with *Berenicea gracilis* (Edw.), var. *tenuis* (Rss.). Middle Chalk. Chatham. Gamble Coll.

50,472. Two young zoaria on echinid fragments (on slide). Chalk. England. Morris Coll.

D. 2985. Two zoaria on a bone of '*Ichthyosaurus campylodon.*' Lower Chalk. Folkestone. Capron Coll. The larger zoarium appears linearly grooved, probably owing to shrinkage or flattening of the bone.

D. 2984. A well-preserved zoarium of var. *oceanica* (Orb.), encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2983. A large zoarium, without gonocysts, encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 5156. A young zoarium on an *Inoceramus* fragment, with a young zoarium of *Berenicea gracilis* (Edw.), var. *tenuis* (Rss.), (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3915. A zoarium 15 mm. in diameter, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3908. A regular zoarium, with imperfectly developed gonocysts, encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3914. A medium-sized zoarium, with one gonocyst and a young zoarium, encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3910. An elliptical zoarium, encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3883. A zoarium, with an irregular but complete gonocystal band, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3913. Two zoaria, without gonocysts, encrusting a fragment of *Micraster,* sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3898. A large circular zoarium, with an irregular series of gonocysts, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3916. A medium-sized, thick zoarium, encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3900. A broken zoarium, with gonocysts, encrusting an *Echinocorys* fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3899. A very large broken zoarium, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 961. Two irregular zoaria of var. *echinata* (Orb.), on slide. Middle Chalk. Chatham. Vine Coll. Recorded by Vine as *Diastopora papillosa*.

D. 4105. A large zoarium on a fragment of *Inoceramus*, with *Berenicea regularis* (Orb.), var. *gamblei*. Middle Chalk. Chatham. Gamble Coll.

D. 3881. A large regular zoarium, with gonocysts, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3885. A thin zoarium, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3909. A zoarium, with gonocysts and young zoarium attached, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3907. A thick zoarium, with irregular gonocysts, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3882. A zoarium, with circular series of gonocysts, encrusting echinid plate (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3880. A large irregular zoarium, encrusting a shell fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3911. A regular zoarium, without gonocysts, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2659. Two thin zoaria on an echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 987. A series of three attached zoaria on an echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2689. Two broken zoaria on echinid fragments (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2688. A large typical zoarium, with gonocysts, on an echinid plate (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2693. Two large thin zoaria, with *Membranipora*, sp., on an echinid plate (on slide). Middle Chalk. Chatham. Vine Coll.

D. 3001. Two thin zoaria, encrusting an *Echinocorys scutatus* (on slide). Upper Chalk. Charlton. Presented by G. C. Crick, Esq.

D. 3006. A zoarium with apertures regularly arranged on curved intersecting lines, encrusting *Echinocorys scutatus* (on slide). Upper Chalk. Bromley. J. Simmons Coll.

D. 3894. A broken, weathered zoarium, encrusting an echinid plate (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2973. A regular zoarium, without gonocysts, encrusting a fragment of *Echinocorys* (on slide). Upper Chalk. Loc. ? J. Morris Coll.

D. 479. Several zoaria, with *Stomatopora gracilis* (Edw.), on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll., 1893.

D. 508. With *Onychocella*, sp., on *Inoceramus*. Middle Chalk. Chatham. Gamble Coll., 1893.

D. 512. With *Stomatopora granulata* (Edw.), *Membranipora*, sp., etc., on *Echinocorys scutatus*. Middle Chalk. Chatham. Gamble Coll., 1893.

D. 717. With *Stomatopora granulata* (Edw.) and *Proboscina*, sp., on *Inoceramus*. Middle Chalk. Chatham. Vine Coll., 1823. No. 1 recorded by Vine as *Diastopora papillosa*, var. *echinata*: Rep. Brit. Assoc. 1892, p. 30.

D. 958. On echinid fragment, with *Actinopora*, sp. Middle Chalk. Chatham. Vine Coll. Recorded as *Diastopora papillosa*, Orb., by Vine, 1893 : Rep. Brit. Assoc. 1892, p. 308, No. 16.

D. 2979. Two zoaria, with *Proboscina cornucopiæ* (Orb.) and *Hippothoa*, sp. Upper Chalk. S.E. of England. Toulmin Smith Coll. One zoarium has well raised peristomes and is a typical *papillosa* (as now accepted); the other has low, worn peristomes, like those of d'Orbigny's *oceanica*.

D. 3839. A broken zoarium on a fragment of *Echinocorys*, with *Proboscina fasciculata* (Rss.), var. *toucasi*, and *Membranipora*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 2990. With *Membranipora*, sp., etc., on *Echinocorys scutatus*. Middle Chalk. Chatham. Presented by Wm. Gamble, Esq., 1889.

D. 4194. Two subcircular zoaria, of which one has well raised peristomes. The specimens were identified by M. Pergens as *B.* [*D.*] *papillosa*, var. *echinata*. Middle Chalk. Chatham. Gamble Coll.

D. 3816. A zoarium encrusting a fragment of *Echinocorys*, sp., with *Proboscina sarthacensis*. Middle Chalk. Chatham. Gamble Coll.

D. 3947. Three zoaria on a slide, with two specimens of *Reptomultisparsa rowei*, Greg. Middle Chalk. Chatham. Gamble Coll.

D. 3815. A zoarium of var. *echinata* (Orb.), encrusting an *Echinocorys scutatus* with *Proboscina fasciculata* (Rss.) and *Stomatopora granulata* (Edw.). Middle Chalk. Chatham. Gamble Coll.

D. 2037. An indeterminable specimen on a *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Recorded as *Diastopora papillosa* (Rss.)? by Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 477, No. 27.

Foreign.

D. 4590. A zoarium of var. *echinata* (Orb.) surrounding a Bryozoan branch (on slide). Craie tuffeau. Villardin Stat. Purchased 1898.

D. 4389. A zoarium of var. *hagenowi*, Rss., encrusting a fragment of *Elasmostoma consobrina* with *Proboscina sarthacensis* (Perg). Cenomanian: Craie chloritée. Cap de la Hève, Seine-Inférieure. Presented by Wm. Hill, Esq.

D. 4391. A zoarium of var. *hagenowi*, Rss., encrusting a fragment of *Elasmostoma consobrina* with *Stomatopora granulata* (Edw.) and *Micropora*, sp. Cenomanian: Craie chloritée. Cap de la Hève. Presented by Wm. Hill, Esq.

D. 4397. A zoarium of var. *echinata* (Orb.) encrusting an *Exogyra*, sp. Cenomanian: Craie glauconieuse. Lisores, near Vimoutiers, Calvados. Presented by Wm. Hill, Esq.

D. 3768. An irregular zoarium of var. *echinata* (Orb.) Senonian: Santonian. L'Arche de Levés. Gamble Coll.

D. 4592. An irregular zoarium of var. *echinata* (Orb.) with low peristomes (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4595. A zoarium of var. *echinata* (Orb.) surrounding a cylindrical branch (on slide). Turonian: Craie marneuse. Villardin Stat. Purchased 1898.

D. 4591. A zoarium of var. *echinata* (Orb.) surrounding a Bryozoan branch (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

5. **Berenicea regularis** (d'Orbigny), 1851.

SYNONYMY.

Diastopora regularis, d'Orbigny, 1851. Bry. Crét. pl. 636, figs. 9, 10.
? ,, ,, Vine, 1890. Bry. Red. Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 476
,, ,, Pergens, 1890. Revision, p. 334.
? ,, ,, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Sec. vol. xi. p. 380.
? ,, ,, Vine, 1892. Addit. Cret. Polyz.: *ibid.* vol. xii. p. 160.
,, ,, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 152.
,, ,, Canu, 1898. Bry. St. Cal.: *ibid.* vol. xxv. p. 743.
Berenicea ,, d'Orbigny, 1854. Bry. Crét. p. 865.
? ,, ,, Wiltshire, 1869. Red Chalk: Quart. Journ. Geol. Soc. vol. xxv. p. 187.
,, ,, Peron, 1893. Desc. Brach. Bry. Tunisie, p. 341.
? *Diastopora densata*, d'Orbigny, 1851. Bry. Crét. pl. 637, figs. 1, 2.
? ,, *orbicula*, d'Orbigny, 1851. *Ibid.* pl. 637, figs. 3, 4.
Berenicea conferta, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 109, pl. xxvi. fig. 11; pl. xxvii. fig. 1.
,, ,, von Reuss, 1874. Bry. ob. Plän.: *ibid.* pt. 2, p. 131.
? *Diastopora concreta*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 15, pl. i. fig. 20.
Reptotubigera ramosa, var. *disciformis*, Vine, 1893. Rep. Brit. Assoc. 1892, p. 308.

DIAGNOSIS.

Zoarium large, flabelliform; regular or irregular. Surface smooth.

Zoœcia short; as a rule only visible at the distal ends; they may be immersed in the zoarium or (in weathered specimens) sharply separated from one another.

Peristomes raised to medium height; very irregular in distribution; crowded together, especially near the margin of the zoarium.

Dimensions.

	D'Orbigny's type (*fide* Pergens).	French Cenomanian specimens (*fide* Canu).	B.M. D. 3886.
Distance of apertures of same longitudinal series	—	·21–·28 mm.	·2–·4 mm.
Diameter of zoœcia	·12 mm.	·20[1]	·15–·2 ,,
Diameter of apertures	·04 ,,	—	·06–·08 ,,

Distribution.

British:

Upper Chalk: S.E. of England.
Middle Chalk: Chatham.
? Red Chalk: Hunstanton.

Foreign:

Turonian: Strehlen, Saxony, in Upper Pläner; Villardin, Loir-et-Cher.
Cenomanian: Le Mans, Janières, and St. Calais, Sarthe; Villers, Calvados; Île Madame, Charente-Inférieure; Havre and Cap de la Hève, Seine-Inférieure; Plauen and Strehlen, Saxony, in Lower Pläner; Kank, Bohemia, in Korycaner Schichten; El-Aïeïcha, Tunis.

Figure.

Pl. VII. Fig. 8. A young typical zoarium, × 10 dia. Turonian: Villardin Station, from Craie marneuse. **D. 4593.**

Affinities.

By its rather thick, flabelliform zoarium, with short, irregularly distributed zoœcia, this 'species' is allied to *B. littoralis* (Orb.); from this form it differs by the smaller diameter of its zoœcia, which are more closely packed. In these characters it resembles *B. papillosa* (Rss.), which has the zoœcia rather more regular in distribution, while the zoarium is discoid and thinner.

Some forms of *B. regularis* (Orb.) resemble *B. gracilis* (Edw.) in the shape of the zoarium and the distribution of the central zoœcia; but the two species differ by the crowding of the lateral zoœcia in *B. regularis*. The species differs from the *B. papillosa*, form *grandis*, by the more uniform distribution of the apertures and the flabelliform shape of the zoarium.

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[1] M. Canu remarks: "mes mesures sont identiques à celles de Pergens" (Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 473); but in the only comparable dimensions given by those authors the measurement quoted by M. Canu is 66 °/₀ above that of M. Pergens.

The fact that d'Orbigny named this species *regularis*, and that he included within it the forms he had originally named *D. densata* and *D. orbicula*, suggests a comparison with *B. papillosa* (Reuss), as that species is regular, densely crowded, and orbicular. But the names in this case are not descriptive, for *B. regularis* has its zoœcia less crowded and less regularly arranged, and the zoarium is flabelliform rather than circular.

Pocta's figure of his *Diastopora concreta* agrees with the characters of the central part of a zoarium of this 'species'; but the dimensions he gives are much greater.

The nearest Jurassic ally of this 'species' is *Berenicea allaudi* (Sauv.), in which the zoœcia are somewhat shorter and broader, somewhat fusiform in shape, and more uniformly distributed.

The specimens of this 'species' may be conveniently divided into three varieties, *ambita*, *gamblei*, and *elliptica*, in addition to the typical form.

LIST OF SPECIMENS.

British.

D. 2642. Indeterminable zoarium, labelled *B. regularis* by Vine (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4104. A young zoarium encrusting an *Inoceramus* fragment. Middle Chalk. Chatham. Gamble Coll.

D. 4163. A young zoarium encrusting an *Inoceramus* fragment. Middle Chalk. Chatham. Gamble Coll.

D. 2038. A zoarium on *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. (No. 28A). With an indeterminable specimen named *Proboscina toucasiana* (Orb.) by Vine. The specimen is recorded as *Diastopora regularis* by Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 476.

Foreign.

D. 4593. A young, typical zoarium, encrusting an Escharine fragment (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Figd. Pl. VII. Fig. 8.

5a. Berenicea regularis (Orb.), var. ambita,[1] nov.

Synonymy.

Reptotubigera ramosa (*non* d'Orb.), var. *disciformis*, Vine, 1893. Rep. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 308.

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[1] From *ambio*, 'to border,' from the smooth selvage round the zoarium.

VARIETAL CHARACTERS.

Zoarium thick and very irregular in shape; usually extensive. Surface punctulate, with an irregular selvage bare of apertures.

Zoœcia large; visible only at the distal ends, most of the zoœcia being immersed in the zoarium.

Apertures very irregular in arrangement; large. Peristomes well raised.

DIMENSIONS.

	B.M., D. 3886.
Distance of adjacent apertures in same longitudinal series	·2–·4 mm.
Diameter of zoœcia	·15–·2 ,,
Diameter of apertures	·06–·08 ,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURES.

Pl. VI. Fig. 7. Part of a zoarium, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3886.**

Fig. 4. Part of a zoarium, showing selvage, × 12 dia.

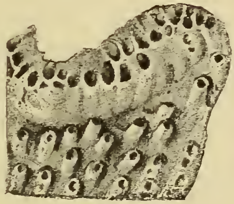

FIG. 4.—*Berenicea regularis* (Orb.), var. *ambita*. The margin of a zoarium, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4262.**

AFFINITIES.

This variety is characterized by its smooth selvage, which is free from apertures. The zoœcia are larger than in the typical Turonian form, but smaller than in the var. *gamblei*.

LIST OF SPECIMENS.

D. 3886. A large zoarium encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VI. Fig. 7.

D. 985. A zoarium of var. *ambita* encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll. The *Reptotubigera ramosa*, var. *disciformis*, Vine, 1892: Rep. Brit. Assoc. 1893, p. 30, No. 12.

D. 978. A zoarium of var. *ambita* encrusting an echinid fragment with *Proboscina anomala*, Rss. (on slide). Middle Chalk. Chatham. Vine Coll.

D. 3887. A thick zoarium of var. *ambita* encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3925. A bilobed zoarium of var. *ambita* encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3928. Six irregular, broken zoaria of var. *ambita*. Middle Chalk. Chatham. Gamble Coll.

D. 4262. A zoarium of var. *ambita* encrusting an echinid fragment. Middle Chalk. Chatham. Gamble Coll. Fig. 4, p. 93.

5b. **Berenicea regularis** (Orb.), var. **gamblei,** nov.

Varietal Characters.

Zoarium very irregular; thick.

Zoœcia large and stout; very irregular in arrangement; mainly immersed. Peristomes well raised.

Dimensions.

	B.M., B. 1756.
Distance of apertures of same longitudinal series	·4–·6 mm.
Diameter of zoœcia	·2–·25 ,,
Diameter of apertures	·1–·15 ,,

Distribution.

England:
Middle Chalk: Chatham.

Foreign:
Cenomanian: Villers-sur-Mer.

Figures.

Pl. VI. Fig. 8. Part of a zoarium, × 10 dia. Upper Chalk: South of England. Purchased. **B. 1756.**

Pl. VII. Fig. 7. The margin of a zoarium, × 10 dia. Cenomanian: Villers-sur-Mer. **D. 4386.**

AFFINITIES.

This variety differs from *B. regularis*, *ambita*, owing to the greater size of the zoœcia, the more marked elevation of the peristomes, and the absence of the smooth selvage.

The variety is named after Mr. Gamble, who had correctly identified one of the best of the specimens (**D. 3924**) as referable to *B. regularis*.

LIST OF SPECIMENS.

BRITISH.

B. 1756. A zoarium encrusting an echinid fragment. Upper Chalk. South of England. Purchased. Figd. Pl. VI. Fig. 8.

D. 3924. An irregular, thick zoarium, var. *gamblei*, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 520. A small zoarium of var. *gamblei*, encrusting an echinid spine (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3837. A zoarium of var. *gamblei*, encrusting an echinid fragment, with *Proboscina angustata* (Orb.) and *Cribrilina*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4190. An irregular zoarium of var. *gamblei*, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4105. A zoarium of var. *gamblei*, encrusting a fragment of *Inoceramus*, sp., with *B. papillosa* (Rss.), etc. Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

D. 4386. Var. *gamblei*, encrusting *Hemiaster*, sp., with *Proboscina sarthacensis* (Perg.) and *Membranipora*, sp. Cenomanian. Villers-sur-Mer. Presented by Wm. Hill, Esq. Figd. Pl. VII. Fig. 7.

5c. **Berenicea regularis** (Orb.), var. **elliptica**, nov.

VARIETAL CHARACTERS.

Zoarium small and comparatively thin; elliptical in shape; surface flat. No smooth selvage.

Zoœcia large and stout; peristomes crowded or fairly spaced; well raised; regularly distributed.

DIMENSIONS.

	B.M. D.3927.	B.M. D.3896.	B.M. D.3901.
	mm.	mm.	mm.
Distance of peristomes in same longitudinal series	·5	·5	·5–·6
Diameter of zoœcia	·2–·25	·25	·25
Diameter of aperture	·15	·14	·11
Diameter of zoarium	5 × 3·5	3·5 × 4·5	3·5 × 5

DISTRIBUTION.

Middle Chalk: Chatham.

AFFINITIES.

This variety has the same dimensions as *B. regularis*, var. *gamblei*, which is its nearest ally; the two varieties differ in zoarial form and thickness, and in the greater regularity in the distribution of the peristomes in var. *elliptica*. The zoarium resembles that of *B. disciformis*, Hag., but differs owing to the more crowded apertures and larger zoœcia.

FIGURES.

Pl. VII. Fig. 9. A discoid zoarium on an echinid fragment; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3896.**

LIST OF SPECIMENS.

D. 3896. Var. *elliptica*, encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VII. Fig. 9.

D. 3927. A zoarium of var. *elliptica*, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3901. A zoarium of var. *elliptica*, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3926. Three young zoaria of var. *elliptica* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3920. Two small zoaria of var. *elliptica* on echinid fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3890. A large zoarium of var. *elliptica*, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

6. Berenicea acanthina, nov.

SYNONYMY.

Zoarium irregular in form; the young colony is flabelliform.

Zoœcia small; very irregularly arranged; crowded, with highly raised, well separated peristomes, which give the zoarium a rough, spiny aspect.

DIMENSIONS.

Diameter of zoarium	2 × 5 mm.
Distance of peristomes	·25–·6 ,,
Diameter of zoœcia	·1–·15 ,,
Diameter of aperture	·05–·07 ,,

DISTRIBUTION.

Upper Chalk: Bromley.
Middle Chalk: Chatham.

FIGURES.

Pl. VII. Fig. 5. A zoarium, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 429.**

AFFINITIES.

This species is characterized by its highly raised, free peristomes, and its irregular zoarium. Its nearest ally is *B. regularis* (Orb.), of which it may be only a variety. It differs from that species by the great elevation of the peristomes. In *B. regularis*, *gamblei* and *ambita*, the sub-erect habit of the zoœcia leads to the raising of the apertures, but in these forms the zoœcia are crowded, so that the peristomes are not free, and the apertures occur but slightly above the level of the thick zoarium.

Among Cainozoic Bryozoa it most nearly resembles *B. foliacea* (Rss.),[1] from the Austrian Miocene; in the Tertiary form the peristomes are higher and more widely scattered.

LIST OF SPECIMENS.

D. 429. A loose zoarium (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VII. Fig. 5.

D. 524. A small zoarium encrusting a *Vincularia* stem (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2845. Two small zoaria (on slide). Upper Chalk. Bromley. J. Simmons Coll.

D. 3918. A large, free, broken zoarium (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3919. Two irregular zoaria (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3921. A large, irregular zoarium (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3922. Two zoaria encrusting shell fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3923. Three irregular zoaria, with larger zoœcia than usual (on slide). Middle Chalk. Chatham. Gamble Coll.

7. Berenicea disciformis (Hagenow), 1839.

SYNONYMY.

Cellepora disciformis, von Hagenow, 1839. Mon. Rüg.: Neu. Jahrb. 1839, p. 279.

Diastopora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 235.

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[1] *Tubulipora foliacea*, von Reuss. Foss. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. p. 49, pl. vii. fig. 5.

Diastopora disciformis, von Hagenow, 1851. Bry. Maastr. Kr. p. 16, pl. x. fig. 7.
,, ,, Schlüter, 1870. Geogn. Reise sudl. Schw.: Neu. Jahrb. 1870, p. 939.
,, ,, *pars*, Hamm, 1881. Bry. mastr. Ober-Sen. p. 25.
,, ,, *pars*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 15.
,, ,, Stolly, 1892. Kreide Schl. Holst.: Mitt. min. Inst. Kiel, vol. i. pt. 4, p. 245.
,, *fecunda, pars*, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 476.
,, ,, *pars*, Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 379.
,, *radians* (*non* Novak), Vine, 1890. *Op. cit.* p. 477.
,, ,, (*non* Novak), Vine, 1891. *Op. cit.* p. 380.

Diagnosis.

Zoarium small, circular; the disc is thick in the middle and thinner near the margin. Walls faintly wrinkled.

Zoœcia cylindrical, large, of medium length; they are usually visible throughout.

Apertures sparsely scattered, irregular in distribution. Peristomes low.

Dimensions.

		Estimated from von Hagenow's figure.		B.M. D. 2988.
Distance of apertures in same longitudinal series	...	·2–·35 mm.	...	·2–·4 mm.
Diameter of zoœcia	...	·1 ,,	...	·15 ,,
Diameter of apertures	...	·06 ,,	...	·1 ,,

Distribution.

England:

Middle Chalk: Chatham.
Red Chalk: Hunstanton.

Foreign:

Senonian—Maastrichtian: Maastricht.
Campanian: Rügen, in Mucronatenkreide; Lägerdorf, Schleswig-Holstein, in Quadratenkreide.

Figures.

Pl. VI. Fig. 2. Half a zoarium, × 14 dia. Chalk. Loc. ? Old Coll. **D. 2988.**

AFFINITIES.

This 'species' was founded by von Hagenow in 1839 on a specimen from the *Belemnitella mucronata* Chalk of Rügen, and figured by him for a Maastrichtian specimen in 1851. It is characterized by its small thick, discoid zoarium, and its low, irregularly arranged peristomes. Unlike *Berenicea polystoma*, this 'species' is thickest in the middle and thinnest at the margin.

Among Jurassic Bryozoa it most nearly resembles the specimens of *B. archiaci*, Haime, which have no gonocysts;[1] but the peristomes are lower, and the apertures less crowded. The same features separate it from *B. verrucosa* (Edw.). The best Tertiary representative of this form is *B. rotula* (Rss.),[2] which is like a *Berenicea disciformis* surrounded by a peripheral selvage.

LIST OF SPECIMENS.

D. 2988. A zoarium encrusting a fragment of *Inoceramus*. Chalk. Loc. ? Old Coll. Figd. Pl. VI. Fig. 2.

D. 2061. A zoarium 8 mm. in dia., encrusting *Hoplites solenonotus* (Seel.). Red Chalk. Hunstanton. Vine Coll.

D. 2362. A small zoarium. Red Chalk. Hunstanton. Jesson Coll.

D. 2034. A zoarium on a piece of chalk. Red Chalk. Hunstanton. Jesson Coll. Recorded by Vine as *Diastopora fœcunda*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 476.

D. 2036. A zoarium encrusting *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. Recorded as *Diastopora radians*, Nov.? by Vine: *ibid.* p. 477, No. 26.

D. 3932. Two young zoaria encrusting a fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

?**D. 3903.** A large zoarium encrusting a fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 443. A young unworn zoarium encrusting a shell fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2971. A young zoarium encrusting a fragment of *Echinocorys*, sp., with *Stomatopora gracilis* (Edw.), on slide. Upper Chalk. S.E. England. Toulmin Smith Coll.

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[1] *E.g.* Cat. Jur. Bry. pl. iv. fig. 3.

[2] *Diastopora rotula*, von Reuss. Foss. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. p. 51, pl. vii. fig. 8.

8. **Berenicea polystoma** (Römer), 1839.

SYNONYMY.

Cellepora polystoma, Römer, 1839. Verst. nordd. Ool. Geb., App. p. 14, pl. xvii. fig. 6.
Rosacilla ,, Römer, 1840. Verst. nordd. Kr. Geb. p. 19.
Diastopora ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
,, ,, Pergens, 1890. Revision, p. 333.
Berenicea ,, d'Orbigny, 1854. Bry. Crét. p. 863.
Diastopora gracilis (*non* Edw.), Michelin, 1840. Icon. Zooph. p. 5, pl. i. fig. 9.
,, ,, (*non* Edw.), d'Orbigny, 1851. Bry. Crét. pl. 635, figs. 6-9.
? *Diastopora cretacea*, Vine, 1885. Fourth Rep. Polyz.: Rep. Brit. Assoc. 1884, p. 167.
,, *congesta* (*non* Orb.), Vine, 1893. Rep. Cret. Polyz.: Rep. Brit. Assoc. 1892, p. 329.

DIAGNOSIS.

Zoarium circular, small, thick; depressed in the centre.

Zoœcia cylindrical, rather thin; not sinuous, but may curve upward at the distal end. Walls plain. The central zoœcia are visible throughout; but on the margins they are very crowded.

Peristomes well raised; irregularly arranged; crowded.

DIMENSIONS.

	D'Orbigny's specimen (*fide* Pergens).	B.M., D. 2987.	B.M., D. 960.
Distance of apertures in same longitudinal series ...	·3–·5 mm. ...	·2–·4 mm. ...	·3–·5 mm.
Diameter of zoœcia	·15 ,, ...	·15–·2 ,, ...	·12–·15 ,,
Diameter of apertures	·08 ,, ...	·07–·1 ,, ...	·08 ,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:
Rhodanian: Vassy, Bettancourt-la-Ferrée and Baudrecourt, Haute-Marne; Fontenoy and Auxerre, Yonne.
Necomanian: Schöppenstedt, Hannover, in Hilsconglomerat; Sainte Croix, Vaud; Grandpré, Ardennes.

FIGURES.

Pl. V. Fig. 5. Middle Chalk: Chatham. A zoarium, × 10 dia. Vine Coll. **D. 2987.**

Pl. VI. Fig. 1. Middle Chalk: Chatham. Half a worn zoarium with well-marked peripheral, crowded zone; × 14 dia. Vine Coll. **D. 960.**

Affinities.

This species is characterized by its thick, circular zoarium, with the apertures crowded round the margin. It is the Cretaceous representative of *Berenicea verrucosa* (Edw.), from which it differs by the greater elevation of the distal ends of the zoœcia and the greater thickness of the zoarium. In these respects it resembles *B. archiaci* (Haime); but it has not the well-developed gonocysts, and the peristomes are more crowded than in that form.

According to Vine's description his *Diastopora cretacea* has a zoarium with a central depression and a thickened edge, and may thus belong to this form; but the type-specimen is missing from his collection, so that the question cannot be definitely decided.

Among Cainozoic species the nearest to *B. polystoma* is *B. echinulata* (Rss.),[1] which has an even thicker and more crowded zoarium.

LIST OF SPECIMENS.

D. 2987.	Two zoaria (on slide). Middle Chalk. Chatham. Vine Coll. One is figured on Pl. V. Fig. 5.
D. 960.	A worn zoarium an an echinid fragment. Middle Chalk. Chatham. Vine Coll. Recorded as *Diastopora congesta*, Orb., by Vine: Rep. Brit. Assoc. 1892, p. 329. Figd. Pl. VI. Fig. 1.

9. **Berenicea jessoni** (Vine), 1890.

Synonymy.

Proboscina jessoni, Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 471, pl. xix. fig. 7.

" " Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 376.

Diastopora cretacea, var. *lineata*, Vine, 1885. Cambr. Greensd.: *ibid.* vol. ix. p. 18, pl. ii. fig. 8.

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[1] *Diastopora echinulata*, von Reuss. Foss. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. p. 50, pl. vii. fig. 6.

DIAGNOSIS.

Zoarium small, reniform, thin; sometimes piriform, owing to the persistence of a short stalk-like proximal portion.

Zoœcia cylindrical, long, visible throughout their length.

Peristomes irregularly and sparsely distributed; highly raised.

DIMENSIONS.

	Type: from Red Chalk. B.M., D. 2025.	Upper Greensand, Cambridge. D. 2964.
Length of zoœcia ...	1–1·2 mm. ...	·5–·8 mm.
Diameter of zoœcia ...	·2 ,, ...	·13–·2 ,,
Diameter of apertures...	·1 ,, ...	·08–·1 ,,

DISTRIBUTION.

Upper Greensand: Cambridge.
Red Chalk: Hunstanton.

FIGURES.

Pl. V. Fig. 3. A small zoarium, × 14 dia. Upper Greensand: Cambridge. **D. 2964.**

AFFINITIES.

This Bryozoan was first described by Vine in 1885 as *Diastopora cretacea*, Vine, var. *lineata*, and subsequently in 1890 as *Proboscina jessoni*. The second specific name is accepted, since the species is different from '*Diastopora cretacea*,' Vine. The species appears to be a *Berenicea* rather than a *Proboscina*, though it is one of the forms near the dividing-line between the two groups.

Its nearest ally is the Cenomanian *B. contracta*, Seeley, from which it differs by the more uniform diameter of the zoœcia, they being regularly cylindrical and not bottle-shaped. It closely resembles the young stage of *B. diluviana* (Lam.); but comparison of Figures 2 and 3 on Pl. V. shows that the young form of the Lower Greensand species has larger zoœcia, while its peristomes are less raised. The last character, the thinness of the zoarium, and absence of the crowded peripheral zone separate it from *B. confluens*, which it may sometimes resemble, owing to the reniform shape and similar distance of the peristomes in that species.

The nearest Cainozoic ally of this species is *B. flabellum* (Rss.)[1] from the Hungarian Leithakalk; the zoarial characters are the same, but the peristomes of the Tertiary form are lower, more regularly distributed, and more crowded. The resemblance of *B. jessoni* to the young of the Jurassic *B. diluviana*, Lamx., is illustrated by comparison of Figures 2 and 3 on Pl. V.

LIST OF SPECIMENS.

D. 2964. A zoarium encrusting a fragment of *Exogyra*. Upper Greensand. Cambridge. Jesson Coll. Figd. Pl. V. Fig. 3.

D. 2025. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll. The type of *Proboscina jessoni*, Vine, 1890: Quart. Journ. Geol. Soc. vol. xlvi. p. 471, No. 15, pl. xix. fig. 7. A young zoarium.

? **D. 2986.** Two young zoaria of doubtful identification (on slide). Upper Greensand. Cambridge. Jesson Coll.

B. 4455. A zoarium. Upper Greensand. Cambridge. The type of *Diastopora cretacea*, var. *lineata*, Vine. Figd.: Proc. Yorks. Geol. Soc. vol. ix. pl. ii. fig. 8.

9a. **Berenicea jessoni** (Vine), var. **reniformis,** nov.

Varietal Characters.

Zoarium reniform, and very thin.

Zoœcia small and thin, with highly raised peristomes, which are scattered somewhat irregularly.

Gonocysts small; elongate transversely.

Dimensions.

Length of zoœcia	·6 mm.
Diameter of zoœcia	·09 ,,
Diameter of aperture	·06 ,,

Distribution.

Middle Chalk: Chatham.

Figures.

Pl. VII. Fig. 6. A zoarium with two gonocysts on a fragment of *Inoceramus*. Middle Chalk: Chatham. Gamble Coll. **D. 4153.**

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[1] *Diastopora flabellum*, von Reuss. Foss. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. p. 51, pl. vii. fig. 9.

AFFINITIES.

The shape of the zoarium and the distribution of the peristomes in this Bryozoan are similar to the same characters in *B. jessoni* (Vine), from which it differs owing to the greater size of the zoœcia in the typical member of the 'species.'

The gonocysts are of the same type as those of *B. papillosa* (Rss.); but the variety differs from that 'species' by the more widely spaced apertures and reniform shape of the zoarium.

SPECIMEN.

D. 4153. A zoarium encrusting a fragment of *Inoceramus.* Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VII. Fig. 6.

10. **Berenicea contracta,** Seeley, 1866.

SYNONYMY.

Berenicea contracta,	Seeley, 1866. Foss. Up. Greensd. Hunst.: Ann. Mag. Nat. Hist. ser. 3, vol. xvii. p. 181.
,, *folium,*	Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 96, pl. iv. figs. 11–14.
Diastopora ,,	Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 15.
Berenicea pilosa,	Novak, 1877. *Op. cit.* p. 97, pl. iv. figs. 1–10.
Diastopora ,,	Pocta, 1892. *Op. cit.* p. 15.
Proboscina suessi,	*pars,* Novak, 1877. *Op. cit.* p. 103, pl. iv. figs. 25, 26 (*non* pl. v. figs. 14–19).
Diastopora hunstantonensis,	Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 475, pl. xix. fig. 10.
,, ,,	var. *a,* Vine, 1890. *Ibid.* p. 475, pl. xix. fig. 11.
,, *jessoni,*	Vine, 1890. *Ibid.* p. 478, pl. xix. fig. 12.
,, *hagenowi,*	Vine, 1889. Proc. Yorks. Geol. Soc. vol. xi. p. 266, pl. xii. fig. 9.

DIAGNOSIS.

Zoarium discoid, reniform, or regularly flabelliform.

Zoœcia visible throughout; long and sinuous; usually irregular in thickness, being expanded either at the base or at the distal end. The walls are plain or wrinkled. The apertures are distant, and irregularly arranged.

Peristomes usually well raised.

Gonocysts ovoid, granulate; often irregularly T-shaped.

Dimensions.

	B.M., D. 2009.	B.M., D. 2961.
Length of zoœcia	1·2–1·5 mm.	1 mm.
Diameter of zoœcia	·3–·4 ,,	·3–·35 mm.
Diameter of aperture	·16 ,,	·16 ,,

Distribution.

England:
Upper Greensand: Cambridge.
Red Chalk: Hunstanton.

Foreign:
Cenomanian: Kamajk, Kank, Jiné, Velim, and Zbislav, Bohemia, in Korycaner Schichten; Strehlen, Saxony, in Lower Pläner.

Figures.

Pl. IV. Fig. 8. The type of Vine's *Diastopora hagenowi* (Rss.), encrusting a fragment of *Radiolites mortoni*. Upper Greensand: Cambridge. Jesson Coll. Fig. 8*a*, the zoarium, natural size; Fig. 8*b*, the best preserved part of the zoarium, × 9 dia. **D. 2961.**

Pl. IV. Fig. 9. The type-specimen of *Diastopora hunstantonensis*, Vine. Red Chalk: Hunstanton. Jesson Coll. Fig. 9*a*, the zoarium, natural size; Fig. 9*b*, part of the zoarium, × 9 dia. **D. 2009.**

Affinities and Synonyms.

B. folium, Novak, is an exceptionally well-marked 'species,' characterized by its large, thin zoarium and its somewhat club-shaped zoœcia. The form of the zoœcia gives it some interest, for it is not of the simple, cylindrical type of ordinary Cyclostomata. The zoœcia agree in shape more closely with the Palæozoic Cryptostomata than with later types: the resemblance, however, is secondary and homoplastic.

For the name of the species I have felt bound to accept that proposed by Professor Seeley in 1866; it is descriptive, and the diagnosis, though short, is recognizable. Seeley's description has been overlooked by subsequent palæontologists, and on the Continent the name of *B. folium*, Novak, has been generally accepted. In addition to *B. folium* specimens must be referred to *B. contracta*, which have been divided under five other names. The *Berenicea pilosa*, Nov., has more regularly corrugated walls; but in all essential characters it seems to be the same. One of the specimens figured as *Proboscina suessi*, Nov., is a young zoarium of this 'species.' The *Diastopora hagenowi* of Vine is a zoarium in which most of the zoœcia have been crushed in; but a few are preserved and show the typical flask-shaped form. The types of the same author's *D. hunstantonensis* and *D. jessoni* are in the British Museum, and show the typical characters of *B. contracta*; the latter is a young zoarium in the stage equivalent to that of the previously mentioned specimen of *Proboscina suessi*. One of Vine's figures (Q.J.G.S. vol. xlvii. pl. xix. fig. 11*b*) represents a zoœcium expanded into what would be a gonœcium;[1] but I am unable to recognize this character in the specimen.

Accepting *Berenicea contracta* as including the above-mentioned synonyms, it forms an exceptionally well-marked group. The only Jurassic *Berenicea* which presents any signs of close affinity with *B. contracta* is the *B. sauvagei*, Greg.,[2] in which the zoœcia are long and sinuous, and sometimes taper towards the distal end. The 'species' resembles *B. compressa* (Goldf.)[3] in the irregular form of the zoarium and the long, sinuous zoœcia; but the zoœcia in the Jurassic species are cylindrical and not club-shaped; the gonocysts are also different, those of *B. compressa* being small and round and those of *B. contracta* large and irregular.

Among Cretaceous 'species' its nearest allies are *B. gracilis* (Edw.), from which it differs by the greater length and shape of the zoœcia, and *B. papyracea* (Orb.), in which the zoœcia are longer and more regularly cylindrical.

LIST OF SPECIMENS.

D. 2961. Encrusting *Radiolites mortoni.* Upper Greensand. Cambridge. Jesson Coll. Figd. as *Diastopora hagenowi*, Vine: Proc. Yorks. Geol. Soc. vol. xi. pl. xii. figs. 9*a*, *b*.

Figured Pl. IV. Figs. 8*a* and *b*.

D. 2009. A zoarium, the type of *Diastopora hunstantonensis*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 475, pl. xix. fig. 10, encrusting a *Terebratula biplicata.* Red Chalk. Hunstanton. Jesson Coll., No. 1c. On the same specimen is an encrustation marked 1B, figured as *Proboscina angustata*, Orb., by Vine (*op. cit.* pl. xix. fig. 1); and a specimen, probably a *Foraminifer*, recorded as *Stomatopora gracilis* (Edw.) by Vine (*op. cit.* p. 463). The type of *D. hunstantonensis* is refigured on Pl. IV. Figs. 9*a*, *b*.

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[1] See Gregory: Cat. Jur. Bry. p. 12.

[2] Cat. Jur. Bry. p. 82, pl. iii. fig. 4.

[3] *Ibid.* pp. 78–81, pl. iii. figs. 2, 3.

D. 2027. Two zoaria on a broken *Inoceramus*. Red Chalk. Hunstanton. Jesson Coll., No. 17B, *t*, and C, *t*.

No. 17B, *t*, is recorded as *Diastopora hunstantonensis*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 475. No. 17C, *t*, is described and figured as type of *Diastopora hunstantoni*, Vine, var. A, Vine (*ibid.* p. 475, pl. xix. figs. 11*a*, *b*); but the figures may have been drawn from specimen 17B, *t*, rather than from 17C, *t*.

The specimen also bears No. 17A, *t*, the type of *Proboscina hunstantonensis*, Vine: *ibid.* p. 470, pl. xix. figs. 5*a*, *b*.

D. 2035. Encrusting *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll., No. 25.

The type of *Diastopora jessoni*, Vine: Quart. Journ. Geol. Soc. vol. xlvi. pl. xix. fig. 12.

D. 2023. With *Proboscina bohemica* (Nov.). Red Chalk. Hunstanton. Jesson Coll., No. 13B.

D. 2032. On *Terebratula biplicata*. Red Chalk. Hunstanton. Jesson Coll., No. 22.

Recorded as *Diastopora hunstantonensis*, var. A. Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 475.

D. 2060. On *Hoplites solenonotus*. Red Chalk. Hunstanton. Jesson Coll.

? **D. 2960.** Encrusting *Radiolites mortoni*. Upper Greensand. Cambridge. Jesson Coll. Figured as *Diastopora hagenowi*, Vine: Proc. Yorks. Geol. Soc. vol. xi. pl. xii. fig. 9. The specimen is indeterminable.

? **D. 2660.** A small worn specimen. Red Chalk. Hunstanton. Vine Coll.

11. Berenicea canui, nov.

SYNONYMY.

Berenicea virgula (*non* Orb.), von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 115, pl. xxviii. fig. 13.

DIAGNOSIS.

Zoarium simple or compound; of elliptical tufts, which are very thick.

Zoœcia short and large; densely packed. Peristomes well raised; close together; arranged in linear quincuncial series, becoming, however, somewhat irregular at the centre of growth and on the margins.

DIMENSIONS.

Distance of centres of apertures in same longitudinal series...	...	...	·2–·4	mm.
Diameter of zoœcia	... ...	...	·15–·2	,,
Diameter of apertures	... ...	...	·08–·12	,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN.
Cenomanian: Saxony, in Lower Pläner.

FIGURES.

Pl. VI. Fig. 10. A zoarium encrusting an echinid fragment; × 10 dia. (on slide). Middle Chalk: Chatham. Gamble Coll. **D. 3870.**

AFFINITIES.

This 'species' was first figured by von Reuss, who identified it as the *Idmonea virgula* of d'Orbigny. It is an illustration of the great divergence of view in the arrangement of these Cyclostomatous Bryozoa, that von Reuss declares that his Saxon specimens "stimmen völlig" with d'Orbigny's species; although the figures given by the two authors should probably be assigned to different families. The *Idmonea virgula* of d'Orbigny is a true Idmonid, having transverse, alternate, or subalternate rows of zoœcia, with the peristomes well spaced. Von Reuss's *R. virgula* has no such Idmoniiform arrangement; the peristomes are crowded, and occur quincuncially along oblique, intersecting lines. It seems, therefore, necessary to separate the two forms generically, and to propose a new specific name for the *Berenicea.* The species had been in MS. named after von Reuss, but as M. Canu has recently attached the name of that palæontologist to a *Berenicea* another name is necessary for this species. I therefore propose to call it *B. canui.*

LIST OF SPECIMENS.

D. 3870. A two-lobed zoarium, encrusting a plate of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VI. Fig. 10.

D. 3929. A circular zoarium, encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll.

12. Berenicea spissa, nov.

DIAGNOSIS.

Zoarium large and thick; irregular in outline; composed of several radial groups.

Zoœcia short and stout; closely packed. Peristomes highly raised and apertures crowded together. Zoœcia are visible only at their distal ends.

DIMENSIONS.

Diameter of zoarium	... ...	27 × 15 mm.
Length of zoœcia ...	... ...	·25–·4 ,,
Diameter of zoœcia ...	... ...	·2–·3 ,,
Diameter of aperture	... ...	·1–·15 ,,

DISTRIBUTION.

Lower Greensand: Farringdon.

FIGURES.

Pl. VII. Fig. 4. Part of a zoarium, × 10 dia. Lower Greensand: Farringdon. Old Coll. **D. 5790.**

AFFINITIES.

This species is characterized by its short, thick, crowded zoœcia, which appear sub-erect; the zoarium has therefore the aspect of a thin colony of the group which Waters has called the 'Parallelata.' A section, however, shows that the structure of the zoœcia is typically Tubuliporidan. The nearest ally of this Bryozoan is *B. regularis*, var. *gamblei*, which has large, closely packed zoœcia.

Among Jurassic 'species' this form is most nearly allied to *B. coartata*, Greg.,[1] in which, however, the zoœcia are less crowded and the apertures further apart.

The name of the 'species' refers to the thick form of the zoarium; but the most interesting feature in this Bryozoan is its tendency to grow in a series of zoœcial groups, as if it were a very primitive form of *Cellulipora*.

LIST OF SPECIMENS.

D 5790. A zoarium encrusting a valve of *Terebratula*. Lower Greensand. Farringdon. Old Coll. Figd. Pl. VII. Fig. 4.

D. 3024. A zoarium encrusting a sponge fragment. Lower Greensand. Farringdon. Caleb Evans Coll.

And three fragments of the same, with two sections of the base.

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[1] Cat. Jur. Bry. p. 108, pl. v. fig. 2.

D 5155. Two sections showing longitudinal and transverse sections of zoœcia from specimen D. 3024. Lower Greensand. Farringdon.

D. 3029. A worn zoarium encrusting *Terebratula tornacensis*, var. *roemeri*. Lower Greensand. Farringdon. Old Coll.

13. **Berenicea confluens** (von Reuss), 1846 (? Römer, 1840).

SYNONYMY.

? ? *Rosacilla*	*confluens,*	Römer, 1840. Verst. nordd. Kr. p. 19.
? ,,	,,	von Reuss, 1844. Geogn. Skizz. vol. ii. p. 174.
Diastopora	,,	von Reuss, 1846. Verst. böhm. Kr. p. 65, pl. xv. figs. 41, 42.
,,	,,	von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
,,	,,	Vine, 1885. Cambr. Greensd.: Proc. Yorks. Geol. Soc. vol. ix. p. 19.
non Berenicea	,,	von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 110, pl. xxvii. fig. 7.
non ,,	,,	Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 98, pl. iv. figs. 19–22.
non ,,	,,	Fric, 1889. Teplitz. Sch.: Arch. naturw. Landerf. Böhm. vol. vii. No. 2, pp. 57, 89, fig. 96.
? *Cellepora*	*flabelliformis,*	von Hagenow, 1839. Mon. rüg. Kr.: Neu. Jahrb. 1839, p. 279.
? ,,	,,	von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 612.
? *Diastopora*	,,	von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
Unitubigera	*papyracea*	(*non* d'Orb.), Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 479.
,,	,,	(*non* d'Orb.), Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 381.
Reptomulticava	*collis*	(*non* d'Orb.), Vine, 1890. *Op. cit.* p. 481.
,,	,,	(? *ex. syn.*) (*non* d'Orb.), Vine, 1891. *Op. cit.* p. 382.
,,	,,	(*non* d'Orb.), Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 333.

DIAGNOSIS.

Zoarium circular or sub-reniform; thick, with a well-marked peripheral zone of crowded apertures.

Zoœcia of medium length; walls faintly wrinkled. On the upper surface the apertures are spaced fairly widely.

Peristomes well raised.

DIMENSIONS.

	B.M., D. 2981.
Diameter of zoarium	2·5 × 3·5 mm.
Distance of apertures of same longitudinal series	·3–·7 ,,
Diameter of zoœcia	·15–·2 ,,
Diameter of aperture	·08–·12 ,,

DISTRIBUTION.

ENGLAND:
Upper Greensand: Cambridge.
Red Chalk: Hunstanton.

FOREIGN:
? ? Senonian—Campanian: Rügen.
Cenomanian: Gehrden, Hannover; Schillinge, near Bilin, and Kutschlin, Bohemia, in Lower Pläner.

FIGURES.

Pl. V. Fig. 4. A young zoarium, × 10 dia. Upper Greensand: Cambridge. **D. 2981.**

AFFINITIES.

The position of this species is very unsatisfactory. It was founded in 1840 by Römer, but first figured in 1846 by von Reuss, who gave figures of two specimens; neither of them is well illustrated, and they may not belong to the same species. Later authors have taken the species for the form badly illustrated by von Reuss's fig. 4. The earlier description by Römer does not suggest the same species as von Reuss's Bohemian form; and Römer added to the difficulty of understanding his own diagnosis by quoting von Hagenow's *Cellepora flabelliformis* as a synonym. The original description of that fossil does not agree with Römer's diagnosis, or with von Reuss's species. For, according to Römer, his *Rosacilla confluens* is "kreisrunde," and consists "aus mehren Schichten," whereas von Hagenow describes his species as "vielgestaltiger," and consists of a "zarter Überzug von grösserer oder geringeren Ausdehnung."

It therefore seems best to disallow Römer's species on the ground of inconsistent diagnosis.

The main difficulty in dealing with the *B. confluens* (Rss.), as here accepted, rests in its separation from *Berenicea polystoma* (Röm.). Comparison of Pl. V. Fig. 4 with Pl. VI. Fig. 1 shows that the specimens here separated between the two species are closely allied. In *B. polystoma* the zoœcia are more crowded and the peristomes more highly raised. The resemblances between the original figures of the two forms given by von Reuss and Römer are not so striking; the two species are linked by the resemblance between worn specimens referred to *B. polystoma* and those of *B. confluens*.

But as *B. confluens* is altogether an unsatisfactory species it is safer to accept it provisionally until more accurate information is available regarding Römer's type, as well as of the specimens which von Reuss referred to it.

LIST OF SPECIMENS.

D. 2981. A young reniform zoarium. Upper Greensand. Cambridge. Jesson Coll. Figd. Pl. V. Fig. 4.

D. 2039. A zoarium encrusting *Terebratula biplicata.* Red Chalk. Hunstanton. Jesson Coll. Recorded as *Unitubigera papyracea* (Orb.) by Vine: Quart. Journ. Geol. Soc. vol. xlvi. p. 479, No. 29.

D. 2047. A zoarium encrusting *Terebratula biplicata.* Red Chalk. Hunstanton. Jesson Coll. Recorded as *Reptomulticava collis*, Orb., by Vine: *ibid.* p. 481, No. 36.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. antipodum, Tate, 1867.

Syn. *Berenicea antipodum*, Tate, 1867. Quart. Journ. Geol. Soc. vol. xxiii. p. 162, pl. viii. figs. 1*a*, *b*.

Char.—A close ally of *B. gracilis*, but the apertures are shown in one figure to occur in regular, linear series. The figure of the complete zoarium does not confirm this, and the statement in the description that the 'cells' are quincuncial also suggests that figure 1*b* is incorrect.

Distrib.—Neocomian: Prince Alfred's Rest; and mouth of Sunday River, S. Africa.

2. circularis (Pocta), 1892.

Syn. *Diastopora circularis*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 14, pl. i. fig. 13, pl. iii. fig. 31.

Char.—Zoarium circular, with a group of zoœcia with highly raised peristomes in the middle, and a smooth, thin peripheral selvage.

Distrib.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

Aff.—Allied to *B. polystoma* (Röm.).

3. clementina (d'Orbigny), 1851.

Syn. *Diastopora clementina*, d'Orbigny, 1851. Bry. Crét. pl. 636, figs. 1, 2.
? ,, ,, Vine, 1889. Bry. Greensd.: Proc. Yorks. Geol. Soc. vol. xi. p. 269.
,, ,, Pergens, 1890. Revision, p. 334, pl. xi. fig. 5.
? ,, ,, Vine, 1892. Addit. Cret.: Proc. Yorks. Geol. Soc. vol. xii. p. 154.

Diastopora clementina, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 329.
Berenicea ,, d'Orbigny, 1854. Bry. Crét. p. 865.
non ,, ,, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 109, pl. xxvi. fig. 8.
? ,, ,, Vine, 1891. Cret. Polyz.: Rep. Brit. Assoc. 1890, p. 387.

Distrib.—England—Gault: Folkestone and Cambridge. Upper Greensand: Cambridge (recorded by Vine).
Foreign—Rhodanian: Gurgy, Yonne; La Grange au Roi, Vassy. Neocomian: St. Croix, Vaud.

Aff.—As originally described and figured by d'Orbigny, this appeared to be a well-marked species characterized by a reniform zoarium with very flat upper surface, very low peristomes, strongly corrugated zoœcia, and the apertures spaced at about the same distance as in the original figure of *B. gracilis* (M. Edw.).

Pergens has, however, refigured a specimen, which is presumably d'Orbigny's type. He shows that the peristomes are sometimes raised, and the walls often plain, and though the apertures are occasionally rather crowded, there does not seem to be any very definite distinction between this form and the typical variety of *B. gracilis*; the zoœcia in the latter may be larger, but that may be only a question of age, as the difference in the diameter of the zoœcia is only between ·14 mm. and ·18 mm.

As, however, M. Pergens has had the opportunity of studying d'Orbigny's type the species is not definitely merged.

Vine has recorded the species from the Cambridge Greensand, but I have not found the specimen on which the record was based. He likewise quotes a record of its occurrence in the English Gault, also based on a specimen that cannot be found.

Vine's *Proboscina clementina* was stated at its foundation to be different from *Berenicea clementina*;[1] but the name was omitted from Vine's complete list in 1893, as though it were included in d'Orbigny's species.

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[1] Vine. Addit. Cret.: Proc. Yorks. Geol. Soc. vol. xii. (1892), p. 154, pl. vi. fig. 5.

4. **exigua** (Pocta), 1892.

Syn. *Diastopora exigua*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 17, pl. i. fig. 23.

Char.—Zoarium large, irregular. Zoœcia long, immersed. Peristomes well raised, widely scattered, ·06 to ·08 mm. in diameter.

Distrib.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

Aff.—Allied to *B. papyracea* (Orb.), but with immersed zoœcia; the Cretaceous representative of *B. spatiosa*, Walf.

5. **depressa** (Römer), 1839.

Syn. *Cellepora depressa*, Römer, 1839. Verst. nordd. Ool. Geb., App. p. 14.
Rosacilla ,, Römer, 1840. Verst. nordd. Kr. Geb. p. 19.
Diastopora ,, von Hagenow, 1850. In Geinitz, Grundr. Verst. p. 234.

Char.—Zoarium orbicular, thin. Zoœcia transversely striate. Peristomes prominent.

Distrib.—Neocomian—Elligser Brinke, Alfeld, Hildesheim, and Deister, in Hilsthon.

Aff.—It appears to be closely allied to *B. clementina* (Orb.), but may be distinguished by its raised peristomes and orbicular zoarium. Römer described it as a close ally of *B. orbiculata* (Goldf.), i.e. *B. verrucosa*, Edw.[1]

6. **lacrimopora**, Novak, 1877.

Syn. *Berenicea lacrimopora*, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 97, pl. iv. figs. 23, 24.
,, *grandis* (*non* d'Orb.), von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 109, pl. xxvi. fig. 10.
,, ,, (*non* d'Orb.), von Reuss, 1874. Bry. ob. Plän.: *ibid.* pt. 2, p. 131.
,, *clementina* (*non* d'Orb.), von Reuss, 1872. *Op. cit.* p. 109, pl. xxvi. fig. 8.
Diastopora obelioides, Pergens, 1890. Revision, p. 335, pl. xi. figs. 11, 12.

Char.—Zoarium irregular. Zoœcia sinuous, irregular, and usually clavate owing to a well marked expansion at the distal end. Apertures irregularly distributed.

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[1] See Gregory: Cat. Jur. Bry. pp. 102, 103.

Distrib.—Senonian: Moulineaux.
Turonian: Strehlen and Plauen, Saxony, in Upper Pläner.
Cenomanian: Saxony, in Lower Pläner; Kamajk, Bohemia, in Korycaner Schichten.

7. **littoralis** (d'Orbigny), 1851.

Syn. *Diastopora littoralis*, d'Orbigny, 1851. Bry. Crét. pl. 640, figs. 7, 8.
,, ,, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. mal. Belg. vol. xxi., Mém. p. 201.
Berenicea ,, d'Orbigny, 1854. Bry. Crét. p. 867.
,, ,, Pergens, 1890. Revision, p. 337.
,, ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 509.

Char.—Zoarium thin, irregular, flabelliform. Zoœcia irregular in arrangement, visible only at their distal ends. Peristomes well raised.

Distrib.—Danian: Faxoe.
Senonian—Maastrichtian: Meudon; Royan.
Coniacian: Tours and Joué, Indre-et-Loire; Les Roches, Loir-et-Cher.

Aff.—This Bryozoan has considerable resemblances to *B. regularis*, var. *ambita*, but its characters are indeterminable, as d'Orbigny's figures and description are inconsistent. He remarks that it has "cellules moitiés plus petites" than those of *B. grandis*, but his figures represent the zoœcia of both 'species' of the same diameter; and as the figure of *B. grandis* is magnified either to the same extent or perhaps slightly more than the figure of *B. littoralis*, the latter has, if anything, the broader zoœcia. Pergens dismisses the species by the remark ("Revision," pp. 337–8) that it "est représentée par plusieurs espèces, surtout *Diastopora papillosa*, Reuss."

8. ? **nova** (Pergens & Meunier), 1886.

Syn. *Diastopora nova*, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. mal. Belg. vol. xxi., Mém. p. 200.
Tubulipora congesta, *pars*, von Reuss, 1847. Foss. Polyp. Wien.: Naturw. Abh. vol. ii. p. 49, pl. vii. figs. 1, 3 (*non* 2).

Char.—Zoarium irregular; peristomes well raised marginally. Apertures irregularly linear in arrangement.

Distrib.—Danian: Faxoe (*fide* Pergens & Meunier), and Miocene, Austria. This species is founded on some Austrian Miocene Bryozoa, figured by Reuss and Manzoni. Reuss: Foss. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. (1847), pt. 1, p. 49, pl. vii. figs. 1 3 (*non* fig. 2). Manzoni: Bry. foss. Mioc. Austria-

Ungheria, pt. iii.: Denk. Akad. Wiss. Wien. vol. xxxviii. pt. 2, p. 14, pl. xiii. fig. 54.

9. **oolitica** (Moore), 1870 (*non* Vine, 1881).

Syn. *Lepralia oolitica*, Moore, 1870. Quart. Journ. Geol. Soc. vol. xxvi. p. 243. pl. xvii. fig. 2.
" " R. Etheridge, jun., 1878. Cat. Austr. Foss. p. 105.
" " Jack & Etheridge, jun., 1892. Geol. Pal. Queensl. p. 441, pl. xx. figs. 5, 6.

Char.—Apparently a *Berenicea* in which the reflexed peristome is much thickened. The apertures are irregularly arranged. If my interpretation of Moore's figure be correct, the nearest Cretaceous ally of the species is *B. littoralis*.

Distrib.—Lower Cretaceous: Wollumbilla, Queensland, in Rolling Downs Formation.

10. **rudis**, von Reuss, 1872.

Syn. *Berenicea rudis*, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 109, pl. xxvi. fig. 9.
? *Berenicea hagenowi*, von Reuss, 1872. *Ibid.* p. 109, pl. xxvi. fig. 12.

Char.—Zoarium circular. Zoœcia short and barrel-shaped; crowded at the margin. Apertures irregularly quincuncial in arrangement.

Distrib.—Cenomanian: Saxony, in Lower Pläner. Both encrusting *Ostrea hippopodium*.

REPTOMULTISPARSA, d'Orbigny, 1854.

Synonyms.

Diastopora, pars, von Reuss, 1846, etc.
Berenicea, pars, d'Orbigny, 1854, von Reuss, 1872, etc.
Rosacilla, pars, Sauvage, 1889.
Semimultisparsa, pars, d'Orbigny, 1854.
Proboscina, pars, von Reuss, 1872.

Diagnosis.

Tubuliporidæ in which the zoarium is encrusting, and consists of thick, multilamellar sheets. The zoœcia are cylindrical, and parallel to the surface on which the zoarium has grown. The peristome is flush or slightly raised.

Type Species.

R. microstoma, Michelin, 1846, *em.* Bathonian: Ranville.

Affinities.

This genus is retained, as in the Cat. Jur. Bry., for Berenicoid species with multilamellar zoaria. The difference between this genus and *Berenicea* is not very important, but the separation is convenient, and appears to be not unnatural. *Reptomultisparsa* may be monophyletic, but it may be only an artificial section of *Berenicea.*

1. **Reptomultisparsa haimei,** de Loriol, 1863.

SYNONYMY.

Reptomultisparsa haimeana, de Loriol, 1863. Invert. Néoc. Inf. Salève, pt. ii. p. 136, pl. xvii. fig. 4.
,, ,, Keeping, 1883. Neoc. Upware, p. 137.

DIAGNOSIS.

Zoarium encrusting; very thick and large: composed of large zoœcial groups.

Zoœcia small and short: somewhat regularly arranged, with a tendency towards a quincuncial distribution of the apertures, which are, however, distant, small, and with low peristomes.

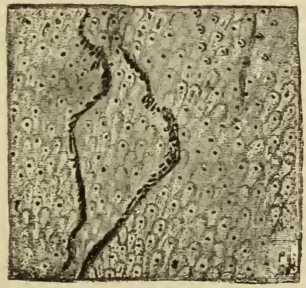

Fig. 5. — *Reptomultisparsa haimei*, Lor. Part of a zoarium, × 6 dia. Lower Greensand: Farringdon. **10,265.**

DIMENSIONS.

Length of zoœcia	·6–1 mm.
Diameter of zoœcia	·2–·25 ,,
Diameter of aperture	·1 ,,

DISTRIBUTION.

ENGLAND:

Lower Greensand: Farringdon; Upware (*fide* Keeping).

FOREIGN:

Hauterivian: La Varappe, near Geneva.

FIGURES.

Fig. 5. Part of a zoarium encrusting a *Raphidonema*, × 6 dia. Lower Greensand: Farringdon. **10,265.**

AFFINITIES.

M. de Loriol-le-Fort remarks that this species is allied to *R. congesta*, Orb.; but in addition to the zoarial differences that he noticed between them, they are separable by the greater shortness of the zoœcia.

10,265. A zoarium encrusting *Raphidonema*, sp. Lower Greensand. Farringdon. Figd. Fig. 5.

2. Reptomultisparsa congesta (von Reuss), 1846.

SYNONYMY.

Diastopora congesta,	von Reuss, 1846. Verst. böhm. Kr. p. 65, pl. xv. fig. 43.
,, ,,	von Hagenow, 1850. In Geinitz, Quadersandst. p. 234.
non ,, ,,	d'Orbigny, 1851. Bry. Crét. pl. 640, figs. 1–3.
Berenicea congesta,	Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 509.
Diastopora fecunda,	Vine, 1885. Cambr. Greensd.: Proc. Yorks. Geol. Soc. vol. ix. p. 18.
,, ,,	Vine, 1889. Greensd. Polyz.: Proc. Yorks. Geol. Soc. vol. xi. pp. 266–9.
,, ,,	stage *congesta,* Vine, 1889. *Ibid.* p. 269, pl. xii. figs. 10, 10*b*.
,, ,,	*congesta,* Vine, 1891. Cret. Pol.: Rep. Brit. Assoc. 1890, p. 389.
,, ,,	Vine, 1891. Pol. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 379.

DIAGNOSIS.

Zoarium beginning as circular discs, which are convex above. The zoarium increases into irregular, nodular masses.

Zoœcia long, thin, and cylindrical; the apertures are distant and irregularly distributed. The peristomes are low. The walls are plain.

DIMENSIONS.

	B.M., B. 4452. Young zoœcia.		B.M., D. 2861. Older zoœcia.
Length of zoœcia ...	·5 mm.	...	·6–1·0 mm.
Diameter of zoœcia ...	·14 ,,	...	·2 ,,
Diameter of aperture ...	·1 ,,	...	·08–·11 ,,

DISTRIBUTION.

ENGLAND:

Chalk Detritus: Charing.
Upper Greensand: Cambridge.
? Red Chalk: Hunstanton.

FOREIGN:

Cenomanian: Schillinge, near Bilin, Bohemia, in Lower Pläner.

FIGURES.

Pl. VI. Fig. 5. A young zoarium, the type of Vine's *D. fecunda*; × 7 dia. Upper Greensand: Cambridge. Vine Coll. **B. 4452.**

Pl. VI. Fig. 6. A young zoarium, × 10 dia. Chalk Detritus: Charing. T. R. Jones Coll. **D. 2861.**

Pl. VII. Fig. 3. A nodular zoarium. Fig. 3*a*, upper surface of the zoarium, natural size; Fig. 3*b*, part of the same from the side, × 7 dia. Upper Chalk: Guildford. Capron Coll. **D. 3030.**

AFFINITIES.

This zoarium begins as a Berenicoid disc, and by the rapid superposition of the successively developed zoœcial groups it becomes massive.

The main characters of the species are its long, thin zoœcia, and its regular zoœcial groups. Its Jurassic representative is *R. microstoma* (Mich.),[1] in which, however, the apertures occur in more regular, curved series. The nearest Cainozoic ally of this species is the '*Diastopora corrugata*,' Rss.,[2] from South-Western Russia.

LIST OF SPECIMENS.

B. 4452. A young zoarium of three confluent discs (on slide). Upper Greensand. Cambridge. Vine Coll. The type of *Diastopora fecunda*, Vine. Proc. Yorks. Geol. Soc. vol. ix. p. 18. Figd. Pl. VI. Fig. 5.

D. 1866. Two small zoaria (on slide). Upper Greensand. Cambridge. Jesson Coll. Recorded by Vine as *D. congesta*, d'Orb., *non* Reuss.

? D. 2962. A young, discoid zoarium, on *Pharetrospongia strahani*. Upper Greensand. Cambridge. Jesson Coll. Identified by Vine as *Diastopora fecunda*, Vine.

D. 3160. A worn zoarium and a thin vertical section of the same (on slide). Upper Greensand. Cambridge. Old Coll.

D. 2861. A young zoarium. Chalk Detritus. Charing. T. R. Jones Coll. Figd. Pl. VI. Fig. 6.

D. 2864. A young zoarium, 3 mm. in dia. (on slide). Chalk Detritus. Charing. T. R. Jones Coll.

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[1] Michelin: Icon. Zooph. p. 243, pl. lvii. fig. 1; Cat. Jur. Bry. p. 114.

[2] A. E. von Reuss. Tert. Bry. Kischenew in Bessarabien: Sitz. Akad. Wiss. Wien. vol. lx. pt. 1 (1870), p. 510, pl. i. figs. 6, 7; pl. ii. figs. 1–5.

D. 2865. A very young zoarium, 2·5 mm. long (on slide). Chalk Detritus. Charing. T. R. Jones Coll.
D. 3030. A nodular compound zoarium. Upper Chalk. Guildford. Capron Coll. Figd. Pl. VII. Figs. 3*a–b*.
? D. 2963. A specimen labelled by Vine *D. fecunda*. Upper Greensand. Cambridge. Jesson Coll.

3. **Reptomultisparsa sowerbyi** (Lonsdale), 1850.

SYNONYMY.

Diastopora sowerbyi, Lonsdale, 1850. Dixon, Geol. Suss., p. 271, pl. xviii. A, figs. 2, 2*a*.
,, ,, Vine, 1885. 4th Rep. Brit. Assoc. 1884, p. 168.

DIAGNOSIS.

Zoarium a thick, flat sheet, formed of numerous superposed Berenicoid discs. Apertures arranged subradially. The zoœcial groups are separated by lines of crowded apertures or by solid ridges. Zoœcia stout, short, crowded. Peristomes low.

DIMENSIONS.

	D. 2991.
Zoarium	25 × 27 mm.
Length of mature zoœcia	1·0 ,,
Diameter of mature zoœcia	·3 ,,
Diameter of aperture	·1–·2 ,,

DISTRIBUTION.

Chalk: Maidstone, Sussex.

FIGURES.

Pl. VII. Fig. 2. Part of a typical specimen, × 7 dia. Upper (?) Chalk: Maidstone. Old Coll. **D. 2991.**

AFFINITIES.

This 'species' is closely allied to *R. congesta* (Rss.), from which it differs by the greater stoutness of the zoœcia, which are more crowded: the apertures are not only closer together, but subradially arranged. By the last character this species presents an approach to *Cellulipora*, as has been remarked by Professor Seeley.[1]

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[1] H. G. Seeley. Foss. Up. Gr. Hunst.: Ann. Mag. Nat. Hist. ser. 3, vol. xvii. (1866), p. 181.

But the growth of the zoarium as a series of zoœcial discs is different from that of *Cellulipora*; the zoarium, in fact, is a compound *Berenicea*, not a compound *Discosparsa*.

D. 2991. A zoarium from Upper (?) Chalk, near Maidstone. Old Coll.

4. Reptomultisparsa rowei, nov.

Synonymy.

Diastopora congesta (*non* Reuss), d'Orbigny, 1851. Bry. Crét. pl. 640, figs. 1–3.
Reptomultisparsa congesta, d'Orbigny, 1854. *Ibid.* p. 878.
Diastopora confluens (*non* Reuss), d'Orbigny, 1851. *Ibid.* pl. 640, figs. 4–6.
,, *papillosa, pars*, Pergens, 1890. Revision, p. 334.

Diagnosis.

Zoarium of elliptical or slightly irregular discs, piled upon one another. The series usually decreases gradually in size from the lowest to the youngest zoœcial group. But in some cases the uppermost layer expands laterally and buries the rest.

Zoœcia of medium length and diameter. Apertures close together, and regularly distributed. In old zoœcial groups there is a peripheral belt of crowded apertures. Peristomes low.

Gonocysts ?

Dimensions.

	B.M., D. 3944.
Diameter of zoarium	7 mm.
Distance of apertures in same longitudinal series	·4–·7 ,,
Diameter of zoœcia	·15–·25 ,,
Diameter of aperture	·06–·1 ,,

Distribution.

England:
Upper Chalk: Offham, near Lewes.
Middle Chalk: Chatham.

Foreign:
Senonian—Santonian: Saintes, Charente-Inférieure.
Coniacian: Tours, Indre-et-Loire; Varennes, Loir-et-Cher.

Figures.

Pl. VII. Fig. 1. Part of a zoarium, including four superimposed zoœcial groups; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3944.**

Affinities.

Reptomultisparsa rowei differs from *R. congesta* owing to the greater diameter and shorter length of the zoœcia. The zoaria of the two species are, moreover, very different, for *R. rowei* consists of flat superimposed Berenicoid discs, whereas *R. congesta* is formed of a series of conical masses.

The zoœcial characters and the peripheral zone of crowded zoœcia resemble those of *B. confluens* (Reuss), but the apertures are less crowded. In this latter respect the 'species' resembles *B. papillosa* (Rss.), var. *oceanica* (Orb.); but it differs from that form by the presence of the peripheral zone of apertures, and the rarity or possibly complete absence of gonocysts.

The *Berenicea confluens* (Röm.) of Novak[1] may be a closely allied species of *Reptomultisparsa*, but if so, it may be easily distinguished from *R. rowei* by the greater irregularity in distribution of the peristomes. Novak clearly recognized that the *R. congesta* of d'Orbigny is nearer to the *Diastopora confluens* of von Reuss than it is to that author's *D. congesta*.

The Jurassic representative of this species is *R. undulata* (Mich.),[2] which has a more massive zoarium, longer zoœcia, and a more wrinkled surface.

LIST OF SPECIMENS.

D. 3944. A zoarium formed of four zoœcial groups, encrusting a fragment of *Echinocorys*, sp. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VII. Fig. 1.

D. 3879. An irregular worn zoarium, encrusting a fragment of *Echinocorys*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 3938. A zoarium 2 mm. thick and 6 mm. in diameter, encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3940. A zoarium 1·5 mm. thick and 12 mm. in diameter, encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3939. An irregular zoarium encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3941. A large irregular zoarium encrusting a fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3942. An irregularly heaped zoarium encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

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[1] Novak. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 98, pl. iv. figs. 19–22.

[2] Michelin: Icon. Zooph. p. 242, pl. lvi. fig. 15. Cat. Jur. Bry. p. 115, pl. vi. figs. 2, 3.

D. 3943. A regular trilaminar zoarium encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3945. A thin zoarium encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4246. A small zoarium encrusting a fragment of *Micraster*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4247. A young zoarium on slide with ? *Radiocavea*. Middle Chalk. Chatham. Gamble Coll.

D. 3930. A regularly convex zoarium (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3931. A thick massive zoarium encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3879. A worn zoarium encrusting an echinid fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2692. An irregular zoarium encrusting a fragment of *Echinocorys*, sp. (on slide). Middle Chalk. Chatham. Vine Coll.

D. 3888. Encrusting a fragment of *Inoceramus*, sp., with *Berenicea gracilis* (Edw.), var. *tenuis* (Rss.), and *Hippothoa*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 2993. A young thick zoarium, in flint. Chalk. Loc.? Old Coll.

D. 3933. A young zoarium formed of four small zoœcial groups, and in the Berenicoid stage (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3934. A zoarium in the sub-Berenicoid stage, consisting of two superimposed zoœcial groups (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3947. Two zoaria on slide, with three specimens of *Berenicea papillosa* (Rss.). Middle Chalk. Chatham. Gamble Coll.

D. 2992. A zoarium, 50 mm. long by 45 mm. broad. Upper Chalk. Loc.? Bowerbank Coll.

D. 3031. Two irregular zoaria. Upper Chalk. Offham Pit, near Lewes. Capron Coll.

5. **Reptomultisparsa megalopora** (Vine), 1885.

SYNONYMY.

Diastopora megalopora, Vine, 1885. Cambr. Greensd.: Proc. Yorks. Geol. Soc. vol. ix. p. 19, pl. ii. figs. 9, 9*a–c*.
,, ,, Vine, 1889. Polyz. Greensd.: *ibid.* vol. xi. p. 269.

DIAGNOSIS.

Zoarium beginning as thick discoid zoœcial groups, which expand into broad sheets, or are piled into multilaminar masses.

Zoœcia short, stout, sub-erect; mainly immersed in the zoarium, and visible only at the distal end.

Peristomes scattered at the centres of zoœcial groups, but very crowded at the margins.

DIMENSIONS.

	Type B. 4456.	D. 1858.	D. 1871*a*. Figd. Pl. VI. Fig. 3.
Distance of apertures ...	·4 mm. ...	·4 mm. ...	·4–·7 mm.
Diameter of zoœcia ...	·25–·3 ,, ...	·3 ,, ...	·3 ,,
Diameter of apertures ...	·11–·15 ,, ...	·1–·15 ,, ...	·15–·2 ,,

DISTRIBUTION.

Upper Greensand: Cambridge.

FIGURES.

Pl. VI. Fig. 3. The young zoarium figured by Vine (*op. cit.* pl. ii. figs. 9*a* – *c*), × 8 dia. Upper Greensand: Cambridge. Jesson Coll. **D. 1871.**

AFFINITIES.

This Bryozoan is represented in the collection by four specimens, all of which were labelled, and two of which were figured by Vine. The 'species' is most nearly allied to *Reptomultisparsa aggregata* (Rss.),[1] which closely resembles the specimen figured by Vine (Proc. Yorks. Geol. Soc. vol. ix. pl. ii. figs. 9*a* – *c*). The differences between the two groups of individuals are that in *R. aggregata* the zoœcia are packed together more closely and more uniformly.

LIST OF SPECIMENS.

B. 4456. The type-specimen. Upper Greensand. Cambridge. Vine Coll. Figd. Proc. Yorks. Geol. Soc. vol. ix. pl. ii. fig. 9. (The figure is unsatisfactory.)

D. 1871*a*. The zoarium figured by Vine as showing the "ovicells." Upper Greensand. Cambridge. Jesson Coll. Figd. Proc. Yorks. Geol. Soc. vol. ix. pl. ii. figs. 9*a–c*. The specimen is refigured on Pl. VI. Fig. 3.

D. 1871*b*. Another zoarium on the same slide as D. 1871*a*. Upper Greensand. Cambridge. Jesson Coll.

D. 1858. A large encrusting specimen (on slide). Upper Greensand. Cambridge. Jesson Coll.

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[1] *Proboscina aggregata*, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 114, pl. xxviii. figs. 10, 11.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **aggregata** (Reuss), 1872.

Syn. *Proboscina aggregata*, von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 114, pl. xxviii. figs. 10, 11.

Char.—Zoarium thick; much lobed; of sub-erect, very crowded zoœcia, with the peristomes separated only by linear depressions.

Distrib.—Cenomanian: Lower Pläner, Saxony.

Aff.—Nearly allied to *R. megalopora*, Vine, but with more crowded zoœcia.

2. **confluens,** *auct.* (? Röm.; cf. p. 110).

Syn. *Berenicea confluens* (*exc. syn.*), von Reuss, 1872. Bry. unt. Plän.: Palæontogr. vol. xx. pt. 1, p. 110, pl. xxvii. fig. 7.
,, ,, ,, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 98, pl. iv. figs. 19–22.
,, ,, Fric, 1889. Teplitz. Sch.: Arch. Naturw. Landesf. Böhm. vol. vii. No. 2, pp. 57, 89, fig. 96.

Char.—Zoœcia short, broad, with low peristomes, which are irregularly distributed, and very crowded in discoid groups. Growing in superposed discoid zoœcial colonies.

Distrib.—Cenomanian—Korycaner Schichten: Kamajk.
Teplitzer Schichten: Handorf (Scaphiten Kalk) and Kutschlin.
Lower Pläner: Schillinge, near Bilin.

3. **dutempleana,** d'Orbigny, 1853.

Syn. *Reptomultisparsa dutempleana*, d'Orbigny, 1853–4. Bry. Crét. p. 877, pl. 761, figs. 8–10.
,, ,, Pergens, 1890. Revision, p. 338.

Char.—Founded on a worn, indeterminable zoarium (*fide* Pergens).

Distrib.—Albian: Grandpré, Ardennes.

4. **glomerata,** d'Orbigny, 1850.

Syn. *Diastopora glomerata*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 636, figs. 7, 8.
Reptomultisparsa ,, d'Orbigny, 1854. *Ibid.* p. 877.
,, ,, Pergens, 1890. Revision, p. 338.

Char.—Founded on a worn, indeterminable zoarium (*fide* Pergens), probably allied to *R. rowei*, Greg.

Distrib.—Cenomanian: Cap de la Hève.

5. **tuberosa,** d'Orbigny, 1851.

Syn. *Diastopora tuberosa*, d'Orbigny, 1851. Bry. Crét. pl. 639, figs. 1–3.
Semimultisparsa ,, d'Orbigny, 1854. *Ibid.* p. 871.
Diastopora grandis, pars, Pergens, 1890. Revision, p. 335.

Char.—Zoarium very massive. Zoœcial groups discoid or lobed, in regular layers. Peristomes low, distant, and fairly uniformly distributed.

Distrib.—Senonian—Maastrichtian : Meudon.
Coniacian : Villedieu, Loir-et-Cher.
Turonian : Lavardin, Loir-et-Cher ; La Rousselière, Charente.

6. **tuberosa** (von Reuss), 1874 (*non* d'Orb.).

Syn. *Diastopora tuberosa,* von Reuss, 1874. Bry. ob. Plän. : Palæontogr. vol. xx. pt. 2, p. 132, pl. xxv. figs. 2, 3.

Char.—Zoarium of irregular, nodular masses. Zoœcia short, stout, and apparently sub-piriform.

Distrib.—Turonian—Upper Pläner : Saxony.

DIASTOPORA, Lamouroux, 1821.

Synonyms.

Ceriopora, pars, Goldfuss, 1827.
Diastopora, pars, Pergens, 1890 ; Canu, 1898.
Mesenteripora, de Blainville, 1834.
Polytrema, pars, d'Orbigny, 1850.
Bidiastopora, pars, d'Orbigny, 1851.
Cisternifera, pars, Walford, 1894.
Ditaxia, pars, von Hagenow, 1851.

Diagnosis.

Diastoporidæ in which the zoarium is erect and foliaceous, and consists of fronds, which may be simple and lobed, or divided into multifid segments, or crumpled into sub-hemispherical masses, or coiled into cylindrical, infundibuliform tubes. The zoarium is bilaminar or unilaminar. The zoœcia are cylindrical.

Peristomes flush with the surface of the zoarium, or but slightly raised.

Gonœcia are often present.

Type Species.

Diastopora foliacea, Lamx., 1821. Bathonian : France.

AFFINITIES.

This genus is by no means the most typical or central member of the family to which it gives its name. In the Catalogue of the Jurassic Bryozoa, as a concession to the neontologists, the name Tubuliporidæ was accepted instead of Diastoporidæ, which has been adopted by the majority of palæontologists. After a study of the genus *Tubulipora* it appears necessary to include that genus in the Idmoniidæ. It seems therefore advisable to abandon the name Tubuliporidæ, unless the whole of the Diastoporidan and Idmonian series are included in one family, an arrangement which few palæontologists would be likely to adopt.

Diastopora is accepted for Diastoporidæ which are frondose and erect, while the allied encrusting forms are referred to *Berenicea*. This course does not agree with the definitions of most zoologists; and it is even less in accord with their practice. If any generic separation be made between the adnate and foliaceous species, then certainly the name *Diastopora* must be retained for the latter, for it was founded for a single erect species from the Bathonian. Neontologists have gradually adopted *Diastopora* for both the adnate and foliaceous species; and then, though covering both types by their diagnosis of the genus, they have removed the erect species to *Mesenteripora* and left in *Diastopora* the adnate forms alone. Thus Busk, in the Catalogue of Cyclostomata in the British Museum, includes in *Diastopora* four species, all of which are adnate, while the one erect species is assigned to *Mesenteripora*; Hincks accepts four British species of *Diastopora*, all of which are adnate, though he includes *Mesenteripora* as a synonym for the "foliaceous bilaminate forms."

The most difficult question in regard to this genus is its relation to *Mesenteripora*, which was founded by de Blainville[1] for bilaminar species, *Diastopora* being restricted to unilaminar species in which the zoœcia occur only on one face of the frond. D'Orbigny[2] accepted both genera, practically in de Blainville's sense; but he introduced the idea of a *lame germinale*, which in *Mesenteripora* forms a median layer, and in *Diastopora* covers the reverse face. Pergens accepted both genera, mainly on the basis of this 'germinal layer.' He restricted this structure to *Mesenteripora*, and doubtfully removed that genus to the family of the Entalophoridæ.

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[1] De Blainville: Man. Act. 1834, p. 432.

[2] D'Orbigny: Bry. Crét. pp. 807, 825.

In referring to M. Pergens' treatment of this genus in the Cat. Jur. Bry.[1] the remark was made that "Pergens has retained the genus [*Diastopora*] for the unilaminate forms, transferring *Bidiastopora* and *Mesenteripora* to the Entalophoridæ." This remark has been severely criticized by M. Canu,[2] and it may be based on a misunderstanding of M. Pergens' treatment of one species. Pergens refers to *Diastopora* twelve 'species'; of these eight 'species' are *Bereniceæ*, and are therefore necessarily unilaminar; of the erect species *D. tubulosa*, *D. mutata*, and *D. escharoides* are admittedly unilaminar; while all the species included in *Mesenteripora* are stated, according to the diagnosis of that genus, to have "zoécies sur les deux faces." The only species at all doubtful is *D. marginata*, in respect of which Pergens[3] says: "la colonie n'a pas de lame germinale, mais elle est formée de deux couches adossées, comme on les rencontre dans les *Diastopora* du Bathonien." It seemed to me that M. Pergens thus implied that *D. marginata* consists of two unilaminar fronds, growing back to back by some accident of growth, and that the bilaminar arrangement of his species of *Mesenteripora* is essentially distinct. It would possibly have been better to say that *Diastopora* is simply laminar instead of unilaminar, which might have prevented M. Canu's misconception of my interpretation of M. Pergens' reasons for removing *Mesenteripora marginata* to *Diastopora*.

The 'Germinal Layer.'

Reference to this question necessitates consideration of the taxonomic value of this 'lame germinale.' The term is inappropriate, as the layer has no proved connection with any germinal function, and accordingly in the Cat. Jur. Bry. (p. 13) the merely descriptive name of 'zoarial lamina' was adopted for it. Such a layer occurs most strongly developed in bilaminar erect zoaria, and especially in those with crowded zoœcia; but a similar layer forms the reverse face of unilaminar fronds, and forms the base of Berenicean colonies (round the margin of which it often projects). D'Orbigny called the outer layer of the zoaria of *Discosparsa* a germinal layer. M. Pergens apparently does not, as the character is not mentioned in his diagnosis of that genus. The layer is also well developed in some species of *Retecava* (the *Reticulipora* of Pergens), where its structure appears to be identical with that of '*Mesenteripora*,' though again it is not noticed in M. Pergens' diagnosis.

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[1] Cat. Jur. Bry. p. 117.

[2] Canu. Ovic. Bry. Occ.: Bull. Soc. géol. Fr. ser. 3, vol. xxvi. p. 265.

[3] Pergens: Revision, p. 336.

Hence M. Pergens appears to use the term 'lame germinale' in a more restricted sense than did d'Orbigny, although what difference there is between the structure of this layer in *Discosparsa*, *Berenicea*, *Reptomultisparsa*, and '*Mesenteripora*' does not appear. In *Multisparsa foliacea*, Orb., there are several parallel vertical laminæ separating the successive zoœcial layers. D'Orbigny's figure does not indicate any structural difference between these laminæ; but M. Pergens claims only the middle one as a 'lame germinale.'

Until some structural difference be demonstrated, or even rendered probable, between this middle layer of *Multisparsa* and *Mesenteripora* and the similar supporting or 'zoarial lamina' of other genera, it seems inadvisable to accept the 'germinal layer' as a feature of generic value. M. Pergens seems to have been uncertain as to its significance, for he only included '*Mesenteripora*' in the Entalophoridæ with some doubt.

A strong argument against the validity of this 'germinal layer' is given by the specimen of *Diastopora auricularis* figured on p. 134, in which the zoœcia open on both faces in one part of the zoarium; which elsewhere divides into two laminæ with the zoœcia on only one face of each. Where the zoarium is double there is a strong 'germinal layer,' as in *Mesenteripora*; where the zoarium is single there is only the thin reverse layer of typical *Diastopora*. The 'germinal layer' or zoarial lamina appears to be a basal, calcified layer, epithecal[1] rather than germinal in character.

Further evidence against the 'germinal layer' is given by recent specimens of Diastoporidæ in the Zoological Department of the British Museum. Some specimens of *Diastopora repens* (Hasw.) illustrate clearly the nature of the zoarial lamina. The zoarium of this species is partly unilaminar and partly bilaminar; in the former case the zoarial lamina occurs on one face, and the zoarium is a *Diastopora*; where it is bilaminar, the zoarial lamina occurs as a median layer, and the zoarium is a *Mesenteripora*. The most instructive feature in the specimen (Fig. 7) is a young colony, which is in an almost *Discosparsa* stage; here the zoarium can be followed from the simple thin unilaminar condition, into the thick bilaminar *Mesenteripora* condition with crowded zoœcia and well-developed median zoarial lamina.

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[1] It might be better to speak of this layer as epizoarial than as epithecal; but from its analogy with the corresponding structure in corals, the less correct but now established term may be retained.

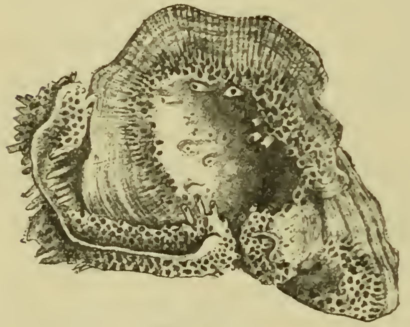

Fig. 6.

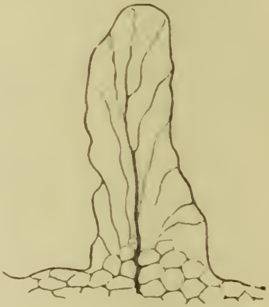

Fig. 7.

Fig. 6. — Part of a zoarium of *Diastopora repens* (Hasw.), showing the unilaminar cup-shaped central portion, and part of a bilaminar frond with zoarial lamina; × 8 dia. Recent: Australia.

Fig. 7.—Part of vertical transverse section across a young frond of *Diastopora repens* (Hasw.), showing the zoarial lamina; × 16 dia. Recent: Australia.

As the 'germinal layer' is therefore apparently not of generic value, I see no reason for the retention of *Mesenteripora* as a genus distinct from *Diastopora*. Part of d'Orbigny's *Bidiastopora* is also included in this genus.

Ditaxia compressa, Hag., is a thick *Diastopora*, which grew in shallow water, and has a thickly calcified zoarium; the considerable development of the zoarial lamina is a natural correlation. In *Diastopora marginata*, on the contrary, the frond is very thin, the zoœcia are long, and the apertures widely scattered; accordingly the zoarial lamina is thin and inconspicuous, and the rudimentary, young zoœcia—the 'germes' of d'Orbigny—are few and scattered.

1. **Diastopora escharoides**, Michelin, 1845.

SYNONYMY.

Diastopora escharoides, Michelin, 1845. Icon. Zooph. p. 218, pl. liii. fig. 18.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 636, figs. 3–5.
,, ,, d'Orbigny, 1854. *Ibid.* p. 828.
,, ,, Pergens, 1890. Revision, p. 336.
non Entalophora fistulata, d'Orbigny, 1851. Bry. Crét. pl. 619, figs. 13–15.
Diastopora tubulus, d'Orbigny, 1851. Bry. Crét. pl. 641, figs, 9, 10.
,, ,, d'Orbigny, 1853–4. *Ibid.* p. 829, pl. 758, fig. 13.
? ,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 402.
,, *tubulosa, pars*, Pergens, 1890. Revision, p. 333.
,, *pustulosa, pars*, Hamm, 1881. Bry. mastr. Ober-Sen. p. 25.

DIAGNOSIS.

Zoarium unilaminar, in wide, open, irregular tubes. Reverse face covered by wrinkled epitheca.

Zoœcia short and rather stout; apertures in somewhat regular series, and often irregularly quincuncial in arrangement. Peristomes low.

DIMENSIONS.

	D'Orbigny's specimens (*fide* Pergens).
Distance of apertures in same longitudinal series ...	·04–·06 mm.[1]
Diameter of zoœcia	·24 ,,
Diameter of apertures	·12 ,,

DISTRIBUTION.

ENGLAND:
Upper Greensand: Warminster.

FOREIGN:
Senonian—Maastrichtian: Meudon; Fécamp; Sainte-Colombe; Ciply; Royan.
Santonian: Pécine, Pons, Perignac.
Coniacian: Tours, Joué, Luynes, etc.
Turonian: Vendôme, Les Roches, etc., Cher-et-Loir; Merpins, Charente.
Cenomanian: Le Mans, Sarthe.

AFFINITIES.

This 'species' is probably the Cretaceous form of *Diastopora lamourouxi*, Edw.,[2] from which it differs by having less raised peristomes, which are more regularly distributed.

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[1] This figure is probably a misprint for ·4 and ·6 mm.

[2] M. Edwards. Mém. Cris.: Ann. Sci. nat., Zool., ser. 2, vol. ix. p. 225, pl. xv. fig. 2.

D. tubulus is placed by Pergens as one of the synonyms of *D. tubulosa*, but its affinities seem rather with this species. Vine[1] records a "*Diastopora tubulus*, *Entalophora* form," which suggests that he regarded this species as due to the hollowing out of an axial space in an *Entalophora*.

LIST OF SPECIMENS.

British.

D. 3075. A large irregular zoarium, ramifying through a lump of sand, with a fragment of the same, mounted on slide. Upper Greensand. ? Warminster. Toulmin Smith Coll.

D. 3176. Two well-preserved fragments, with worn peristomes. Upper Greensand. Warminster. J. Brown Coll.

Foreign.

D. 3706. Three fragments of zoaria. Cenomanian: Craie chloritée. Le Mans, Sarthe. Jesson Coll.

D. 3707. Two fragments (on slide). Cenomanian: Craie chloritée. Le Mans, Sarthe. Jesson Coll.

2. **Diastopora compressa** (Goldfuss), 1827.

Synonymy.

Ceriopora	*compressa*,	Goldfuss, 1827. Petref. Germ. p. 37, pl. xi. fig. 4.
,,	,,	de Blainville, 1834. Man. Act. p. 414.
Polytrema	,,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 279.
Ditaxia	,,	von Hagenow, 1850. In Geinitz, Quadersandst. p. 242.
,,	,,	von Hagenow, 1851. Bry. Maastr. Kr. p. 50, pl. iv. fig. 10.
Mesenteripora	,,	d'Orbigny, 1853-4. Bry. Crét. p. 811, pl. 756, figs. 10–13.
,,	,,	Staring, 1860. Bod. Nederl. vol. ii. p. 402.
,,	,,	Winkler, 1864. Mus. Teyl.: Cat. Syst. Pal. livr. ii. p. 212.
,,	,,	Hamm, 1881. Bry. mastr. Ob.-Sen. p. 25.
,,	,,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 16.
,,	,,	Pergens, 1890. Revision, pp. 368, 369.
,,	*neocomiensis*,	d'Orbigny, 1853–4. Bry. Crét. p. 808, pl. 756, figs. 7–9.
,,	*meandrina*,	Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 153.
,,	,,	Canu, 1898. Bry. Cal.: *ibid.* p. 747.

Diagnosis.

Zoarium of broad, thick, bilaminar fronds, slightly lobed at the margins; the fronds are flat or slightly crumpled.

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[1] Vine. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 330.

Zoœcia rather long; well marked; with the apertures well spaced and mostly irregular in arrangement.

Peristomes large.

DIMENSIONS.

	Fide Pergens.
Distance of apertures in same longitudinal series ...	·5–·6 mm.
Diameter of zoœcia	·25 ,,
Diameter of apertures	·08 ,,

DISTRIBUTION.

FOREIGN:

Senonian — Maastrichtian: Meudon; Maastricht; Petit-Lanaye; Sainte Colombe, Manche, in Craie à baculites.
Campanian: Rügen.
Coniacian: Joué, Indre-et-Loire, in Craie de Villedieu.
Cenomanian: Janières and St. Calais, Sarthe.
Neocomian: Bettancourt-la-Ferrée, Haute-Marne.

AFFINITIES.

This species is characterized by its thick, strongly calcified zoarium, and it appears to have lived in comparatively shallow water. It differs from *D. escharoides*, Mich., by its bilaminar zoarium and more crowded zoœcia.

LIST OF SPECIMENS.

D. 1346. Two fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3735. A fragment (on slide). Maastrichter Kreide. Petit-Lanaye. Gamble Coll.

D. 6455. Five fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

3. Diastopora auricularis (d'Orbigny), 1851.

SYNONYMY.

Bidiastopora auricularis, d'Orbigny, 1851. Bry. Crét. pl. 626, figs. 1–4.
Mesenteripora ,, d'Orbigny, 1854. Bry. Crét. p. 810.
,, ,, Pergens, 1890. Revision, p. 369.

DIAGNOSIS.

Zoarium of broad, frondose, lobed expansions, which are somewhat thick; in places the fronds subdivide medially into two unilaminar expansions, which form a cylindrical tube.

Zoœcia slender, uniformly arranged, in regular linear series; the apertures are often quincuncial in position.

Peristomes tall, well raised; they are somewhat crowded. On the upper margin there is a double series of closely packed apertures of unequal size on each face of the zoarium.

Dimensions.

	Fide Pergens.	B.M., D. 419.
Distance of apertures in same longitudinal series	·3–·45 mm. ...	·18–·28 mm.
Diameter of zoœcia	·25 ,, ...	·1–·12 ,,
Diameter of apertures ...	·04 ,, ...	·05–·06 ,,

Distribution.

England:
Middle Chalk: Chatham.

Foreign:
Senonian—Maastrichtian: Royan, Charente-Inférieure.
Santonian: Saintes and Bougnaux, Charente-Inférieure.
Coniacian: Sainte Maure, Tours, Joué, Indre-et-Loire, in Craie de Villedieu.
Turonian: Villedieu, Trôot, Sougé, Loir-et-Cher; Rousselière, near Moutier, Charente; Martigues, Bouches-du-Rhône.

Figure.

Fig. 8. Part of a zoarium, which is in places bilaminar with a zoarial lamina, and elsewhere consists of two separate unilaminar sheets; × 8 dia. Middle Chalk: Chatham. Gamble Coll. **D. 419.**

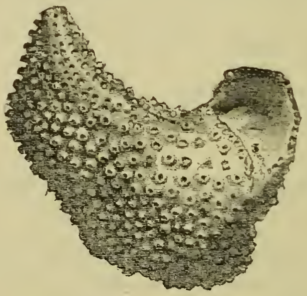

Fig. 8.—*Diastopora auricularis* (d'Orb.). Part of a zoarium, partly unilaminar and partly bilaminar, with a zoarium layer; × 8 dia. Middle Chalk: Chatham. Gamble Coll.

Affinities.

This 'species' helps to illustrate the invalidity of the genus *Mesenteripora* and of the zoarial lamina as a generic character. If the specimen shown on Fig. 8 were broken, then, according to

Pergens, the part on the left-hand side would be included in *Mesenteripora* and the Entalophoridæ, and the other part would be assigned to *Diastopora* as one of the Diastoporidæ.

The zoœcial dimensions of the British specimens are not identical with the original type, but they agree very closely in general characters, having well-raised peristomes, which are crowded and subquincuncially arranged.

LIST OF SPECIMENS.

D. 419. A zoarium partly unilaminar and partly bilaminar, with a 'zoarial lamina' (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. No. 8, p. 134.

D. 3056. A fragment of a tubular zoarium, in flint. Middle Chalk. Chatham. Gamble Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **acuta** (d'Orbigny), 1853.

SYN. *Bidiastopora acuta*, d'Orbigny, 1853–4. Bry. Crét. p. 799, pl. 784, figs. 3–5.[1]
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 17.
,, ,, Pergens, 1890. Revision, p. 367, pl. xi. fig. 7.
,, *campicheana*, d'Orbigny, 1853–4. Bry. Crét. p. 800, pl. 784, figs. 6–8.

CHAR.—Zoarium of narrow, dichotomous branches. Zoœcia fairly large. Peristomes arranged in transverse, oblique bands, or irregular.

DISTRIB.—Neocomian: St. Croix, Vaud.

2. **echinata**, Pocta, 1892.

SYN. *Diastopora echinata*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 16, pl. i. figs. 21, 22.

CHAR.—Zoarium unilaminar, in irregular cylindrical mass. Zoœcia slender; rather crowded.

DISTRIB.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

AFF.—Nearly allied to *D. escharoides*, Mich., but with closer and more slender zoœcia. Also allied to *D. remensis*, Per.

3. **corneti** (M. & P.), 1885.

SYN. *Bidiastopora corneti*, Meunier & Pergens, 1885. Nouv. Bry. Crét. sup.: Ann. Soc. mal. Belg. vol. xx., Mém. p. 37, pl. ii. fig. 9.

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[1] The figure of *D. acuta* has resemblances to *Porina* or *Siphoniotyphlus*.

CHAR.—Zoarium of dichotomous fronds with high peristomes regularly arranged.

DISTRIB.—Senonian—Maastrichtian: Ciply.

4. **foliacea** (d'Orbigny), 1853 (*non* Lamx., 1821).

SYN. *Multisparsa foliacea*, d'Orbigny, 1853–4. Bry. Crét. p. 870, pl. 760, figs. 10–20.
Mesenteripora ,, Pergens, 1890. Revision, p. 369.

CHAR.—Multilamellar; in broad lobed fronds. Peristomes somewhat prominent. Somewhat regular in distribution.

DISTRIB.—Turonian: Rousselière, Moutier, Charente.

AFF.—To be consistent with the adoption of *Reptomultisparsa*, the genus *Multisparsa* should be retained for this species; but species of *Diastopora* are so much less numerous than those of *Berenicea* that little would be gained by the adoption of this course. Should *Multisparsa* not be retained, and *Mesenteripora* be abandoned, this 'species' must be renamed.

5. ? **guilhardina** (Leymerie), 1851.

SYN. *Eschara guilhardina*, Leymerie, 1851. Type Pyren. par. à Craie: Mém. Soc. géol. France, ser. 2, vol. iv. p. 192, pl. ix. fig. 10.

CHAR.—Zoarium of thick, bilaminar, irregular fronds. Apertures large, regularly arranged, very crowded.

DISTRIB.—Senonian—Maastrichtian: La Gesse, Colline de la Barade, Gensac, Tuc, etc., Haute-Garonne, in Calcaire à Orbitolites.

6. **laxipora** (d'Orbigny), 1853.

SYN. *Mesenteripora laxipora*, d'Orbigny, 1853–4. Bry. Crét. p. 812, pl. 756, figs. 14–17.
,, ,, Pergens, 1890. Revision, p. 369.

CHAR.—Zoarium thin, bilaminar. Apertures small, widely scattered; somewhat regularly arranged.

DISTRIB.—Senonian—Maastrichtian: Royan, Charente-Inférieure.
Coniacian: Tours, Indre-et-Loire.
Turonian: Villavard, Lavardin, Trôot, and Sougé, Loir-et-Cher.

7. **lineata**, Gabb & Horn, 1862.

SYN. *Diastopora lineata*, Gabb & Horn, 1862. Foss. Polyz. N. Amer.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 172, pl. xxi. fig. 62.

CHAR.—Zoarium unilaminar, tubular. Peristomes low, subquincuncial in arrangement.

DISTRIB.—Turonian: Timber Creek and Mullica Hill, New Jersey.

8. **marginata** (d'Orbigny), 1853.

Syn. *Mesenteripora marginata*, d'Orbigny, 1853–4. Bry. Crét. p. 809, pl. 785, figs. 1–3.
,, ,, de Loriol, 1868. Val. Arz.: Pal. Suisse, ser. 4, pt. 2, p. 62.
,, ,, de Loriol, 1869. Urg. Land.: Mém. Soc. helv. Sci. nat. vol. xxiii. p. 39, pl. iii. fig. 2.
Diastopora ,, Pergens, 1890. Revision, p. 336.

Char.—Zoarium bilaminar; very thin. Peristomes prominent; very widely scattered; irregular in arrangement.

Distrib.—Neocomian: Sainte Croix and Arxier, Vaud; Landeron, Neuchatel.

9. **mutata**, Pergens, 1890.

Syn. *Diastopora papyracea*, d'Orbigny, 1853–4. Bry. Crét. p. 830, pl. 758, figs. 14–16; *non* 1851, pl. 641, figs. 3, 4.
,, *mutata*, Pergens, 1890. Revision, p. 335.
,, ,, Pergens, 1892. Nouv. Cycl. Crét.: Bull. Soc. belge Géol. vol. iv., Mém. p. 278.

Char.—Zoarium of very thin, flat sheets. Apertures distant, and quincuncial in arrangement. Peristomes prominent.

Distrib.—Senonian—Maastrichtian: Meudon; Fécamp; Sainte Colombe.
Santonian: Saintes, Pécine, and St. Léger.
Coniacian: Tours, Joué.
Turonian: Vendôme, Varennes, Trôot, Sougé, and Les Roches, Loir-et-Cher; St. Germain, Sarthe; Plauen, Saxony.

10. **papyracea** (d'Orbigny), 1853.

Syn. *Bidiastopora papyracea*, d'Orbigny, 1853–4. Bry. Crét. p. 805, pl. 756, figs. 1–3.
,, ,, Pergens, 1890. Revision, p. 375.

Char.—Zoarium of narrow, dichotomous branches, each from eighteen to twenty zoœcia in width. Zoœcial characters doubtful.

Distrib.—Senonian: Pons and Perignac, Charente-Inférieure.

11. **pustulosa** (von Hagenow), 1851.

Syn. *Cavaria pustulosa*, von Hagenow, 1851. Bry. Maastr. Kr. p. 54, pl. vi. fig. 2.
,, ,, d'Orbigny, 1854. Bry. Crét. p. 798.
? ,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 402.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 18.
Diastopora ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 25.
,, *subpustulosa*, d'Orbigny, 1854. Bry. Crét. p. 827.

Char.—Zoarium thick, tubular, dichotomous, with zoœcia opening on one face only. Zoœcia crowded. Apertures irregularly distributed. Peristomes low.

Distrib.—Senonian—Maastrichtian: Maastricht.
Campanian: Rügen.

12. **remensis**, Peron, 1888.

Syn. *Diastopora remensis*, Peron, 1888. Craie S.E. Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. pp. 225, 347, pl. iii. fig. 27.

Char.—Zoarium of broad, open, irregular tubes; closely allied to *D. tubulus*, but with more crowded zoœcia.

Distrib.—Senonian—Campanian—Zone of *Micraster glyphus*: Montbré, near Reims.

13. ? **royana** (d'Orbigny), 1851.

Syn. *Bidiastopora royana*, d'Orbigny, 1851. Bry. Crét. pl. 627, figs. 1–4.
,, ,, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. mal. Belge, vol. xxi. p. 206.

Char.—Compressed dichotomous branches, with small zoœcia on the broad surfaces and much larger zoœcia along the edges.

Distrib.—Danian: Faxoe.
Senonian—Maastrichtian: Royan.

Aff.—The characters of the lateral zoœcia render the generic position doubtful.

14. ? **scobina** (Leymerie), 1851.

Syn. *Adeone scobina*, Leymerie, 1851. Type Pyren. par. à Craie: Mém. Soc. géol. France, ser. 2, vol. iv. p. 191, pl. ix. fig. 6.

Char.—Zoarium of dichotomous, parallel-sided, bilaminar fronds. Apertures distant, arranged in a regular quincunx.

Distrib.—Senonian—Maastrichtian: Gensac, Haute-Garonne, in Calcaire à Orbitolites.

15. ? **subreniformis**, Marsson, 1887.

Syn. *Diastopora subreniformis*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 16, pl. i. fig. 2.

Char.—An erect, unilaminar, reniform zoarium, rising from a short narrow stem; reflexed on the upper margin. Apertures distant over most of the zoarium, but crowded at the margin.

Distrib.—Senonian—Mucronatenkreide: Rügen.

16. **tubulosa**, d'Orbigny, 1850.

Syn. *Diastopora tubulosa*, d'Orbigny, 1850. Prod Pal. vol. ii. p. 86.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 635, figs. 1–3.
,, ,, d'Orbigny, 1854. *Ibid.* p. 827.
,, ,, *pars*, Pergens, 1890. Revision, p. 333.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Proc. verb. p. 204.
,, *megapora*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 635, figs. 4, 5.
Berenicea ,, d'Orbigny, 1854. *Ibid.* p. 863.

Char.—Zoarium tubular, rising from a broad basal expansion. Peristomes very high.

DISTRIB.—Senonian—Coniacian: St. Paterne.
Rhodanian: Fontenoy and Auxerre, Yonne.
Neocomian: Sainte Croix.

17. **vaudensis** (d'Orbigny), 1853.

SYN. *Mesenteripora vaudensis*, d'Orbigny, 1853–4. Bry. Crét. p. 809, pl. 785, figs. 4, 5.
,, ,, Pergens, 1890. Revision, p. 375.

CHAR.—Zoarium mæandriform; of thin sheets. Peristomes tall, quincuncially arranged. Zoœcia marked off by ridges (? due to crushing).

DISTRIB.—Neocomian:[1] Sainte Croix, Vaud.

The type is lost.

18. **hiselyi** (de Loriol), 1869.

SYN. *Mesenteripora hiselyi*, de Loriol, 1869. Urg. Land.: Mém. Soc. helv. Sci. nat. vol. xxiii. p. 40, pl. iii. fig. 1.

CHAR.—Zoarium of thick, broad fronds, with crowded apertures.

DISTRIB.—Urgovian: Landeron, Neuchatel.

? FASCIPORA, d'Orbigny, 1853.

SYNONYMS.

Diastopora, pars, Michelin, 1845.
Entalophora, pars, d'Orbigny, 1850.
Fasciporina, pars, d'Orbigny, 1853.

CHARACTERS.

Zoarium of erect fronds formed of crowded zoœcia. Upper margin flat. There is no prominent zoarial lamina.

TYPE SPECIES.

Diastopora pavonina, Michelin, 1845.

AFFINITIES.

M. Pergens placed this genus in the Fascigeridæ; but it is possibly only a *Diastopora* with a thick zoarium formed of very crowded, densely packed zoœcia. The genus may be fasciculate, and laterally compressed, in which case its resemblance to *Diastopora* is secondary; but the whole aspect of the zoarium appears to me to suggest that it is truly Diastoporidan. In many of the thick zoaria assigned to '*Mesenteripora*' the zoœcia are almost as crowded. The genus is not represented in the Museum collection.

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[1] The horizon is said to be Aptian by d'Orbigny, Bry. Crét. p. 810; but on p. 1,090 the species is included in the Lower Neocomian, and it is omitted from the Aptian list on p. 1,092.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. americana, Gabb & Horn, 1862.

Syn. *Fascipora americana*, Gabb & Horn, 1862. Foss. Polyz. N. Amer.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 165, pl. xxi. fig. 54.

Char.—Allied to *F. pavonina*, Orb., but with more robust, clavate branches, and the peristomes less raised.

Distrib.—Timber Creek and Mullica Hill, New Jersey.

2. flexuosa (d'Orbigny), 1853.

Syn. *Fasciporina flexuosa*, d'Orbigny, 1853. Bry. Crét. p. 695, pl. 744, figs. 16, 17.
,, ,, Pergens, 1890. Revision, p. 377.

Char. — Zoarium of thick, very crumpled, and almost mæandriform fronds. Zoœcia long; peristomes distant. Widely scattered.

Distrib.—Senonian—Santonian: Saintes, Charente-Inférieure.
Coniacian: Tours and Joué, Indre-et-Loire.
Turonian: Lisle and Vendôme, Loir-et-Cher.

3. pavonina (Michelin), 1845.

Syn. *Diastopora pavonina*, Michelin, 1845. Icon. Zooph. p. 218, pl. liii. fig. 17.
Entalophora ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 620, figs. 7–12.
Fascipora ,, d'Orbigny, 1853. *Ibid.* p. 693.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 22.
,, ,, (*exc. syn.*), Pergens, 1890. Revision, p. 377.

Char.—Zoarium cylindrical or flabelliform, very variable in shape. Zoœcia long: walls corrugated. Peristomes irregularly arranged, and distant from one another.

Distrib.—Senonian: Rügen.
Cenomanian: Le Mans.

? SEMIFASCIPORA, d'Orbigny, 1853.

Diagnosis.

Zoarium cupuliform, fixed by its base; from the axial tube a series of costal ridges is given off: the apertures occur mainly on the outer edges of these ridges. Zoœcia typically Diastoporidan in character.

TYPE SPECIES.

Semifascipora variabilis, d'Orbigny, 1853.

AFFINITIES.

The relations of this genus are very uncertain. The zoœcia suggest that it is Diastoporidan; but the zoarium suggests affinities to Theonoidæ. It is not represented in the Museum collection.

variabilis, d'Orbigny, 1853.

SYN. *Semifascipora variabilis*, d'Orbigny, 1853. Bry. Crét. p. 696, pl. 745, figs. 4–8.
,, ,, Pergens, 1890. Revision, p. 377.

CHAR.—As in the genus.

DISTRIB.—Senonian—Maastrichtian: Meudon, near Paris.

DISCOSPARSA, d'Orbigny, 1854.

SYNONYMS.

Diastopora, pars, d'Orbigny, 1851; Hamm, 1881.
Lichenopora, pars, d'Orbigny, 1851.
non Discosparsa, von Reuss, 1872; Marsson, 1887; Pocta, 1892.

DIAGNOSIS.

Diastoporidæ in which the zoarium is small and cupuliform, attached by its central, pointed base.

Zoœcia irregularly arranged: the apertures do not occur in regular, radial lines.

TYPE SPECIES.

Discosparsa simplex, d'Orbigny. Senonian: France.

AFFINITIES.

This unimportant group may be defined as *Bereniceæ* in which the zoaria are cupuliform, and attached only by the centre, instead of being wholly adnate. The genus has been accepted by M. Pergens. Young stages of some species of *Diastopora* pass through a *Discosparsa* stage, and Hincks[1] has proposed its absorption in *Diastopora*.

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[1] Hincks: Brit. Mar. Polyz. p. 460.

Discosparsa simplex (d'Orbigny), 1851.

SYNONYMY.

Diastopora simplex, d'Orbigny, 1851. Bry. Crét. pl. 641, figs. 5–8.
Discosparsa ,, d'Orbigny, 1854. Bry. Crét. p. 823.
" ,, Pergens, 1890. Revision, p. 337.
Lichenopora tuberculata, d'Orbigny, 1851. Bry. Crét. pl. 646, figs. 1–4.
Discosparsa ,, d'Orbigny, 1854. *Ibid.* p. 824.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 402.
Diastopora ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 25.

DIAGNOSIS.

Zoarium small, fairly thick, with short conical base. Upper surface tumid, with central depression. Reverse surface covered by a basal, concentrically marked layer.

Zoœcia large and short. Peristomes arranged subquincuncially.

DIMENSIONS.

	B.M., D. 4256.
Diameter of zoarium	2·6 mm.
Height of zoarium	1 ,,
Diameter of zoœcia	·2 ,,
Diameter of aperture	·1 ,,

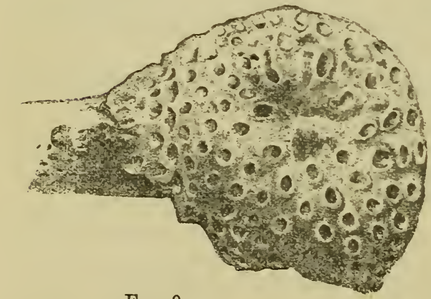

FIG. 9*a*.

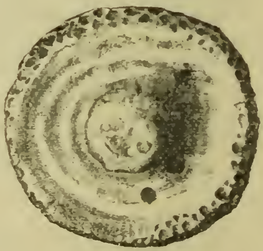

FIG. 9*b*.

DISTRIBUTION.

BRITISH:
Middle Chalk: Chatham.

FOREIGN:
Senonian—Maastrichtian: Fécamp, Seine-Inférieure; St. Germain, near Paris; Ciply; and Mons.
Coniacian: Tours and Luynes, Indre-et-Loire.

FIGURES.

Fig. 9*a*, p. 142. Upper surface of a zoarium, × 15 dia. Fig. 9*b*. The under surface of a younger zoarium, × 15 dia. Both from Middle Chalk: Chatham. Gamble Coll. **D. 4256.**

AFFINITIES.

No species having been selected by any previous palæontologist as the type of the genus, this species may be conveniently chosen.

LIST OF SPECIMENS.

D. 4256. Two zoaria (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. No. 9, p. 142.

D. 4255. Two zoaria (on slide). Middle Chalk. Chatham. Gamble Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. clypeiformis, d'Orbigny, 1853.

SYN. *Discosparsa clypeiformis*, d'Orbigny, 1853–4. Bry. Crét. p. 824, pl. 758, figs. 6–9.
,, ,, Pergens, 1890. Revision, p. 337.
,, ,, Pergens, 1894. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii., Proc. verb. p. 132.

CHAR.—Zoarium large: base concave, with rudimentary basal attachment. Zoœcia slender, with high peristomes.

DISTRIB.—Senonian—Santonian: Saintes and Pécine, Charente-Inférieure.
Coniacian: Tours and Joué, Indre-et-Loire; ? Villedieu, Cher-et-Loir.
Turonian or Coniacian: Les Roches and Arche de Lèves.
Turonian: Vendôme, Cher-et-Loir.

2. cupula, d'Orbigny, 1853.

SYN. *Discosparsa cupula*, d'Orbigny, 1853–4. Bry. Crét. p. 822, pl. 758, figs. 1–5.
,, ,, Pergens, 1890. Revision, p. 337.

CHAR.—Zoarium funnel-shaped, with deep central depression and thick margin of young zoœcia. Zoœcia slender.

DISTRIB.—Turonian: Angoulême, Charente.

3. laminosa, d'Orbigny, 1853.

SYN. *Discosparsa laminosa*, d'Orbigny, 1853–4. Bry. Crét. p. 822, pl. 757, figs. 11–15.
,, ,, Pergens, 1890. Revision, p. 337.

CHAR.—Zoarium funnel-shaped, with broadly open central depression; zoarium thin. Zoœcia slender; apertures irregularly arranged.

DISTRIB.—Cenomanian: Le Mans, Sarthe.

CELLULIPORA, d'Orbigny, 1849.

SYNONYMS.

Cellulipora, d'Orbigny, 1849.[1]
? *Ceriopora, pars*, Römer, 1840; Michelin, 1845.
Reptonodicava, pars, d'Orbigny, 1854.
Monticulipora, pars, d'Orbigny, 1850.
? *Semimulticava*, d'Orbigny, 1854.
Semimultisparsa, pars, d'Orbigny, 1854.

DIAGNOSIS.

Massive Diastoporidæ in which the zoarium consists of zoœcial groups, which are angular in form and packed together. The groups consist of a large number of small zoœcia, with the apertures arranged irregularly or with a tendency towards a radial arrangement. The zoœcial groups are surrounded by a band of rudimentary zoœcia, and separated by a zoarial lamina.

TYPE SPECIES.

Cellulipora ornata, d'Orbigny, 1850: Prod. Pal. vol. ii. p. 175; Bry. Crét. p. 874, pl. 606, figs. 5, 6.

AFFINITIES.

The systematic position of *Cellulipora* is a question of some interest, as the genus has the most massive and specialized zoarium of the Diastoporidæ. The genus was originally included by d'Orbigny in his very comprehensive family the Sparsidæ, but he placed it next to *Reptomultisparsa*, and among the genera now regarded as the Diastoporidæ. At first sight the zoarium looks very unlike a Diastoporidan; but that d'Orbigny was right in his opinion seems most probable from the microscopic structure of the zoœcia. They are of the typical Diastoporidan type. The zoœcia are crowded together, more or less vertical in position, and they agree closely in appearance with those of *Berenicea spissa*. As in that species the zoœcia have a tendency to occur in radial groups, it may be closely allied to the ancestral form of *Cellulipora*.

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[1] D'Orbigny, 1849. Genr. nouv. Moll. bry.: Rev. Mag. Zool. ser. 2, vol. i. p. 500.

Owing to the vertical position of the zoœcia, the frequently infundibular shape of the zoœcial groups, and the presence of a zoarial lamina and a zone of rudimentary zoœcia, the genus presents resemblances to *Discosparsa*, and especially to *Discosparsa cupula*, Orb. In fact, *Cellulipora* may be regarded as a colonial *Discosparsa*, holding similar relations to that genus as *Reptomultisparsa* holds to *Berenicea*.

Cellulipora ornata, d'Orbigny, 1850.

SYNONYMY.

Cellulipora ornata, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 175.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 606, figs. 5, 6.
,, ,, d'Orbigny, 1854. *Ibid.* p. 874.
,, ,, Bucaille, 1890. Bry. Crét. Seine-Infér.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 507.
,, ,, Pergens, 1890. Revision, p. 336.
non Ceriopora spongiosa, Römer, 1840. Verst. nordd. Kr. p. 23.
Diastopora spongiosa, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 637, figs. 5, 6.
Cellulipora ,, d'Orbigny, 1854. Bry. Crét. p. 874.
? *Ceriopora labyrinthica*, Michelin, 1845. Icon. Zooph. p. 208, pl. lii. fig. 11.
? ,, *licheniformis*, Michelin, 1845. Icon. Zooph. p. 205, pl. lii. fig. 5.
? *Semimulticava* ,, d'Orbigny, 1854. Bry. Crét. p. 1031.

DIAGNOSIS.

Zoarium in nodular irregular masses, in ovoid masses, or in thick, flat sheets.

Zoœcial groups quadrangular, pentagonal, or hexagonal; separated by the raised ridges of the zoarial lamina, or by grooves lined by about 6–10 rudimentary zoœcia.

Peristomes very crowded; slightly raised: irregular to subquincuncial in arrangement.

Var. **devonica**, nov.

VARIETAL CHARACTERS.

Zoarium in small ovoid masses. Zoœcial groups much smaller than in type form. Zoœcia proportionately larger.

DIMENSIONS.

	Type form.	Var. *devonica.*
Diameter of zoœcial groups ...	8–10 mm. ...	4–5 mm.
Diameter of zoœcia	·18 ,, ...	·2 ,,
Diameter of aperture	·1 ,, ...	— ,,

DISTRIBUTION.

ENGLAND:

Chloritic Marl: Dunscombe. (Var. *devonica.*)
Upper Greensand: Haldon. (Var. *devonica.*)

FOREIGN:

Cenomanian: Cap de la Hève and Havre, Seine-Inférieure; ? Le Mans; ? near Tournay.

FIGURES.

Fig. 10*a*. Part of a vertical section across two layers of a zoarium of var. *devonica*, × 18 dia. Upper Greensand: Haldon. **D. 5159.**

Fig. 10*b*. Part of a horizontal section across part of the same zoarium, × 18 dia.

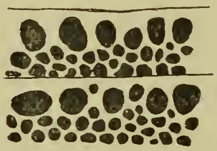

FIG. 10*a*.

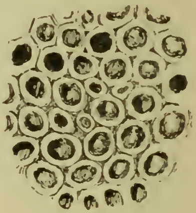

FIG. 10*b*.

Cellulipora ornata, var. *devonica*: Fig. 10*a*, vertical, and Fig. 10*b*, horizontal section.

AFFINITIES.

This species is the type of the genus. Its trivial name is a matter of uncertainty, which can only be settled by re-examination of some of Michelin and Römer's types. I cannot avoid a strong suspicion that the *Ceriopora mammillosa*, Röm., of Michelin is the *C. ornata* of d'Orbigny, and that the *Ceriopora licheniformis* of Michelin is the flat *spongiosa* form of the same species. The *Ceriopora labyrinthica* of Michelin also presents affinities to this genus. But Michelin's figures, though the zoaria are suggestively like those of *C. ornata*, do not show sufficient of the zoœcial characters for certain identification, and d'Orbigny's name is accordingly retained.

The var. *devonica* is well marked, and may be worthy of specific distinction. Its age is the same as the type form, and it may represent the same species with a smaller and ovoid zoarium.

LIST OF SPECIMENS.

British.

D. 5159. A laminated, worn zoarium of var. *devonica*, Greg., and four slides containing sections of the same. Upper Greensand. Haldon. Old Coll. Figd. 10*a* and *b*, p. 146.

B. 1233. Two ovoid and one broken zoarium of var. *devonica*, Greg. Upper Greensand. Haldon. Presented by E. B. Luxmoore, Esq.

D. 3206. A small zoarium, 16 mm. by 2 mm., of var. *devonica*, Greg. Chloritic Marl, No. 10. Dunscombe. Presented by C. J. A. Meyer, Esq.

D. 3629. A depressed, ovoid zoarium of var. *devonica*, Greg. Upper Greensand. ? Haldon. Old Coll. (The specimen was registered as from the Essen Greensand; but its lithological characters show that this is erroneous.)

D. 5158. Four zoaria of var. *devonica*, Greg. Upper Greensand. ? Haldon. Old Coll.

Foreign.

25,327. A flat zoarium, 50 mm. long by 6 mm., of the var. *spongiosa* (Orb.). Cenomanian. Havre. Romain Coll.

60,246. A massive zoarium, shaped like Michelin's figure of *Ceriopora mammillosa*. Cenomanian. Havre. Romain Coll.

60,245. A smaller, similar zoarium. Cenomanian. Cap de la Hève. Tesson Coll.

D. 3671. A massive, well-preserved zoarium. Cenomanian. Normandy. Tesson Coll.

D. 3672. Two zoaria, one of which is the var *spongiosa* (Orb.). Cenomanian. Cap de la Hève. Cunnington Coll.

D. 3685. A zoarium, partly in the form of var. *spongiosa*. Cenomanian. Cap de la Hève. Cunnington Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **bulbosa** (d'Orbigny), 1851.

Syn. *Radiopora bulbosa*, d'Orbigny, 1851–4. Bry. Crét. p. 996, pl. 650, figs. 6–8.
Lichenopora (*Radiopora*) *huotiana*, *pars*, Pergens, 1890. Revision, p. 383.

Char.—Zoarium high, subcylindrical or subpiriform, with a broad base. The sides are horizontally constricted, owing to the overlapping of the layers of which the zoarium is composed.

Distrib.—Cenomanian: Le Mans, France.

2. ? **rugosa** (d'Orbigny), 1853.

Syn. *Semimultisparsa rugosa*, d'Orbigny, 1853–4. Bry. Crét. p. 872, pl. 761, figs. 4–6.
,, ,, Pergens, 1890. Revision, p. 338.

CHAR.—According to Pergens the type is worn and indeterminable; d'Orbigny's description of the very small zoœcia, and of the *côtes* formed by the junction of what is apparently the zoarial lamina, suggests that the species may be a much worn *Cellulipora*.

DISTRIB.—Senonian—Coniacian: Villedieu, Loir-et-Cher.

3. ? **sulcata,** Seeley, 1866.

SYN. *Cellulipora sulcata*, Seeley, 1866. Foss. Up. Gr. Hunst.: Ann. Mag. Nat. Hist. ser. 3, vol. xvii. p. 181.
Diastopora (*Cellulipora*) *sulcata*, Vine, 1891. Rep. Cret. Polyz.: Rep. Brit. Assoc. 1890, p. 395.

CHAR.—Zoarium a flat sheet covered by bosses. Zoœcial groups separated by depressions, on which open rudimentary zoœcia. Described as allied to *Reptomultisparsa sowerbyi*.

DISTRIB.—Red Chalk: Hunstanton.

Family IDMONIIDÆ.

SYNONYMS.

Idmoniidæ, pars, Busk; Pergens; Macgillivray; Marsson, etc.
Tubuliporidæ, pars, Johnston; Smith; Busk; Hincks, etc.
Tubigeridæ, pars, d'Orbigny.

DIAGNOSIS.

Cyclostomata Tubulata in which the zoœcia are simple and tubular, and are grouped into adnate or erect, simple or branched zoaria. The apertures occur on the obverse face only, though the reverse face may be reduced and almost vestigial. The apertures occur in regular series, which are usually transverse, but may be divergent; the transverse series are generally alternate. The walls of the zoœcia are solid.

CRETACEOUS REPRESENTATIVES.

The Idmoniidæ are represented in the Jurassic by only one genus and one adequately known species. In the Cretaceous system the family is almost at its zenith. In later periods there were individuals larger than any known from the Cretaceous, but the range of variation is smaller. The subdivision of the Cretaceous 'species' into genera is difficult; and the naming of the groups is rendered complex owing to the use by neontologists of some palæontological generic names in a different sense from that for which they were proposed.

The simplest of the Cretaceous Idmonids, or at least the species which most nearly resembles the Jurassic 'species' of *Idmonea*, is a Lower Greensand Bryozoan from Berkshire, described by Sharpe as a *Lopholepis*. That 'species' appears to be nearly allied to *I. triquetra*, and is succeeded by some Upper Cretaceous 'species' which differ mainly by the prominence of the peristomes. These adnate, banded species are analogous in the Idmonid series to *Proboscina* in the Diastoporid series. *Phalangella*, the Idmonid analogue of *Berenicea*, is represented by a species *P. radians* (Nov.). *Filisparsa* is similarly represented by *Crisina*. In addition to these groups there is a further series with more specialized zoaria, which is not represented in the Diastoporidæ. Thus, *Retecava* has a well-developed axial rod on the reverse face. In *Reticrisina* the zoarium is reticular, and consists of laterally compressed branches. In *Bitubigera* the zoœcia open in biserial rows.

In his treatment of this family M. Pergens attaches great importance to some tubes which frequently occur on the reverse side of the zoarium, and which he calls "canaux de renforcement."[1] He gives no definite suggestion as to their morphological character, and his own figure of these canals in *Idmonea cenomana*[2] shows that they are the smaller proximal portions of zoœcia. The canals on the left-hand side of Pergens' figure expand as they approach the obverse face at the other end of the figure. These tubuli in other cases are probably rudimentary zoœcia. They occur in the genus *Retecava*, where they form the reverse axial rod.

IDMONEA, Lamouroux, 1821.

SYNONYMS.

Idmonea, Lamouroux, 1821.
non Idmonea of Busk, Hincks, and neontologists.
Reptotubigera, pars, d'Orbigny, 1852.
Lopholepis (*non* von Hagenow), Sharpe, 1854.
Reptoclausa, d'Orbigny, 1854.

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[1] Pergens: Revision, p. 311.
[2] *Ibid.* p. 344.

DIAGNOSIS.

Idmoniidæ with the zoarium adnate, of simple or branched ridges, beside which is a flat, thin selvage. The ridges are usually triangular or subtriangular in transverse section.

Apertures opening in transverse alternate series.

TYPE SPECIES.

Idmonea triquetra, Lamouroux, 1821. Expos. Méth. p. 80, pl. lxxix. figs. 13–15. Bathonian of France and England.

REMARKS.

In the Catalogue of Jurassic Bryozoa the zoarium of *Idmonea* was said to be adnate or erect; but further examination of the post-Jurassic material leads me to go even further from the zoological definition of the genus *Idmonea* than I then ventured to go. The type of *Idmonea triquetra* is very well marked, and different from the erect forms attributed to *Idmonea*. I therefore accept *Idmonea* as originally defined, and accept d'Orbigny's genus *Crisina* for the later developed and more specialized erect members of the family.

The principal synonyms are *Reptotubigera* of d'Orbigny, in which was included the type species of *Idmonea* and the *Lopholepis* of Sharpe (*non* von Hagenow), and *Reptoclausa*, d'Orbigny, which is clearly the same as Sharpe's *Idmonea*.

The nearest ally of *Idmonea* is *Crisina*, which differs by its erect habit and the absence of the lateral selvage. *Phalangella* agrees with *Idmonea* in being adnate, but differs in the irregularity of its series of peristomes and their usually divergent arrangement. *Idmonea* resembles in structure those species of *Proboscina* which, like *P. radiolitorum*, have the apertures in transverse series: but in those *Proboscinæ* the apertures are in single series, and not in regular alternate series. Specimens such as that represented by Fig. 1 on p. 50 suggest that the regularity of such *Proboscinæ* is an unessential, secondary character.

1. **Idmonea hagenowi** (Sharpe), 1854 (*non* Röm., 1840).

SYNONYMY.

Lopholepis hagenovii, Sharpe, 1854. Sands of Farringdon: Quart. Journ. Geol. Soc. vol. x. p. 196, pl. v. fig. 7.

DIAGNOSIS.

Zoarium encrusting, compound; composed of a number of irregularly radial ridges, connected by a lateral basal expansion. The ridges are simple, and do not branch. New ridges rise independently from the basal expansion.

Apertures confined to the ridges. In vertical or slightly oblique rows. The rows are crowded, and those on the two sides of the ridge are alternate. Peristomes only slightly raised.

DIMENSIONS.

	No. 55,110.
Width of zoarial ridge	1–1·4 mm.
Height of zoarial ridge	1·4 ,,
Diameter of aperture	·1–·2 ,,
Distance of peristomial series	·6 ,,

DISTRIBUTION.

Lower Greensand: Farringdon.

FIGURES.

Pl. VIII. Fig. 1*a*. Part of a large encrusting zoarium, showing three ridges and basal selvage; × 5 dia. Fig. 1*b*, a zoarial ridge from the same, seen from the side; × 5 dia. Lower Greensand: Farringdon. Cunnington Coll. **55,110.**

AFFINITIES.

This Bryozoan is an ally of *Idmonea triquetra*, Lam., the type of the genus. Its nearest Cretaceous ally is *Idmonea alipes*, from which it differs by the smaller number of apertures in the transverse rows. It differs from the true *Lopholepis* of von Hagenow, which is a fasciculate form. This species is intermediate between the type species and those on which d'Orbigny has founded *Reptoclausa*.

LIST OF SPECIMENS.

55,110. A large zoarium encrusting a chert pebble. Lower Greensand. Farringdon. Cunnington Coll. Figd. Pl. VIII. Fig. 1.

51,164. A zoarium encrusting cast of a lamellibranch, and three slides showing longitudinal, transverse, and horizontal sections. Lower Greensand. Farringdon. Purchased of J. Sharp, Esq.

D. 4503. Five zoaria on chert pebbles. Lower Greensand. Farringdon. Cunnington Coll.

D. 3026. A zoarium on a chert pebble. Lower Greensand. Farringdon. Old Coll.

D. 3139. A large zoarium encrusting a cast of a lamellibranch. Lower Greensand. Farringdon. Old Coll.

D. 4504. A large zoarium, with *Proboscina crassa* (Röm.), var. *divaricata* (Orb.). Lower Greensand. Farringdon. Cunnington Coll.

D. 4505. A zoarium with a base of an Entalophoroid encrusting a chert pebble. Lower Greensand. Farringdon. Cunnington Coll.

D. 3140. Two zoaria, with *Proboscina*, sp. Lower Greensand. Farringdon. Charlesworth Coll. Purchased 1871.

D. 3141. Two zoaria, with *Proboscina*, sp. Lower Greensand. Farringdon. Charlesworth Coll. Purchased 1871.

2. Idmonea alipes,[1] nov.

DIAGNOSIS.

Zoarium of a long median ridge, bounded by a broad wing-like selvage. The ridge in transverse section is triangular. The selvage is usually marked by divergent, curved ribs; but it may be smooth. The zoarium is unbranched, but two zoaria often diverge from the same point.

Apertures uniserial at the proximal end, but at the distal end they may be triserial, or even quadriserial or quinqueserial. The transverse series are near together. Peristomes slightly raised.

DIMENSIONS.

	D. 3843.	
Length of zoarium	9	mm.
Width of zoarium	4	,,
Width of ridge	·4–1·3	,,
Diameter of zoœcia	·12–·20	,,
Diameter of apertures	·08–1·4	,,
Distance of peristomial series	·4–·5	,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURES.

Pl. VIII. Fig. 2. A zoarium in which the zoœcia appear somewhat irregularly arranged when seen from above, but which on side view are seen to occur in regular transverse series. Zoarium with ribbed selvage; × 8 dia. Middle Chalk: Chatham. Gamble Coll. **D. 465.**

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[1] *I.e.* 'wing-footed.'

Pl. VIII. Fig. 3. A zoarium with more regular, subclavate zoarial ridge and smooth selvage (the elevations on the latter are due to the granules of the echinid plate which the zoarium is encrusting); × 7 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3843.**

AFFINITIES.

This Bryozoan is most nearly allied to *Idmonea hagenowi* (Sharpe), from which it differs by the great width of the selvage and the simple form of the zoarium. The central ridge in its proximal end resembles *Proboscina anomala*, Reuss, but that species has neither the regularly alternate peristomial rows nor the broad selvage of *Idmonea alipes*. A resemblance to *P. anomala* may also be recognized in some specimens when examined from above, as in Pl. VIII. Fig. 2; but on a lateral view the regular transverse rows of peristomes show that it is a true *Idmonea*, and has no connection with *P. anomala*.

LIST OF SPECIMENS.

D. 465. A long, somewhat irregular zoarium, with pinnately striated selvage and the apertures in transverse series of from two to four. On a fragment of *Inoceramus*. Middle Chalk: Chatham. Gamble Coll. Figd. Pl. VIII. Fig. 2.

D. 3843. A typical zoarium on a fragment of *Micraster*. Middle Chalk. Chatham. Gamble Coll. Figd Pl. VIII. Fig. 3.

D. 983. A zoarium on an echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4106. A zoarium on a hinge of *Inoceramus*. Middle Chalk. Chatham. Gamble Coll.

D. 3975. A double zoarium, two branches rising from a common centre; on a fragment of a *Micraster* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3841, D. 3842. Two zoaria on fragments of *Micraster* (on slides). Middle Chalk. Chatham. Gamble Coll.

? **D. 3876.** A broken specimen (on slide). Middle Chalk. Chatham. Gamble Coll.

? **D. 4358.** A clavate zoarium (on slide). Middle Chalk. Chatham. Gamble Coll.

3. **Idmonea cristata** (Meunier & Pergens), 1885.

SYNONYMY.

Reptotubigera cristata, Meunier & Pergens, 1885. Nouv. Bry. Crét. sup.: Mém. Soc. Roy. Mal. Belg. vol. xx. p. 36, pl. ii. fig. 7.

DIAGNOSIS.

Zoarium with a broad, pinnately ribbed selvage. Zoœcia forming a compressed vertical ridge, which is very high, and has subparallel sides.

Apertures in vertical transverse series of from 3 or 4 to from 5 to 9. The series are reflexed at the lower end, in series containing the most numerous zoœcia.

Peristomes well raised, especially those at the upper end of the transverse series.

DIMENSIONS.

	Pergens' type.		B.M., D. 712.
Length of zoarium ...	4–6 mm.	...	5·5 mm.
Width of zoarium ...	2·3 ,,	...	2·3 ,,
Height of zoarial ridge ...	—	...	1 ,,
Width of zoarial ridge ...	—	...	·8 ,,
Diameter of zoœcia ...	—	...	·2–·3 ,,
Diameter of aperture ...	—	...	·1–·15 ,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:
Senonian—Maastrichtian: Petit-Lanaye, Limburg.

FIGURES.

Pl. VIII. Fig. 4*a*. A zoarium seen from above, × 9 dia. Fig. 4*b*, the same from the side, × 9 dia. Middle Chalk: Chatham. Vine Coll. **D. 712.**

AFFINITIES.

The zoarium figured on Pl. VIII. Fig. 4 was identified by Vine as *Reptofascigera alternata* (Orb.), but it differs clearly from that species. To mention only one character, D'Orbigny's species has the apertures in double series, as in *Bitubigera*, which alone is a sufficient generic distinction. The specimens from Chatham agree closely with the original figure, but the transverse series contain fewer zoœcia.

I. cristata differs from *I. hagenowi* by the greater number of zoœcia in the transverse series and the greater prominence of the peristomes. It differs in the first character from *I. alipes*, which, moreover, has a lower and broader zoarial ridge.

LIST OF SPECIMENS.

D. 712. A zoarium identified by Vine as *Reptofascigera alternata*, Orb. Middle Chalk. Chatham. Vine Coll. Figd. Pl. VIII. Fig. 4.

D. 3840. A zoarium longer and with a lower ridge than D. 712; encrusting a fragment on *Micraster* (on slide). Middle Chalk. Chatham. Gamble Coll.

? **D. 4359.** A young zoarium (on slide). Middle Chalk. Chatham. Gamble Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **mæandrina** (de Loriol), 1868.

Syn. *Reptoclausa mæandrina*, de Loriol, 1868. Val. Arz.: Pal. Suisse, ser. 4, pt. 2, p. 62, pl. vi. fig. 1.

Char.—A close ally of *I. hagenowi*, but with more crowded apertures.

Distrib.—Valangian: Arzier, Switzerland.

2. **neocomiensis** (d'Orbigny), 1853.

Syn. *Reptoclausa neocomiensis*, d'Orbigny, 1853–4. Bry. Crét. p. 888, pl. 765, figs. 1, 2.
,, ,, de Loriol, 1863. Invert. Mt. Sal. p. 138, pl. xvii. fig. 7.
,, ,, Pergens, 1890. Revision, p. 342.

Char.—Ridges from 1·5 to 2 mm. long; somewhat elliptical. Apertures in rows of six; rows crowded. Diameter of aperture, ·08 mm.

Distrib.—Neocomian: Switzerland.

Aff.—The oval form of the ridges makes this species appear different from the type of *Idmonea*; but *I. hagenowi* is an intermediate form.

3. **obliqua** (d'Orbigny), 1853.

Syn. *Reptoclausa obliqua*, d'Orbigny, 1853-4. Bry. Crét. p. 888, pl. 765, figs. 3–6.
,, ,, Pergens, 1890. Revision, p. 342.

Char.—Ridges short and oval; apertures in rows of three, and ·08 mm. in dia.

Distrib.—Senonian: France.

The following *nomina nuda* have been proposed. In the absence of any descriptions it is impossible to refer the species to their genera or subgenera.

aculeata,	von Hagenow,	1851.	Bry. Maastr. Kr. p. 25.
bifida	,,	1850.	In Geinitz, Quadersandst. p. 238.
	,,	1851.	*Op. cit.* p. 25.
dimidiata	,,	1850.	,, p. 238.

dimidiata,	von Hagenow,	1851.	*Op. cit.* p. 25.
duplicata	,,	1851.	*Ibid.* p. 25.
polytreta	,,	1850.	*Op. cit.* p. 238.
	,,	1851.	,, p. 25.
teres	,,	1850.	,, p. 238.
	,,	1851.	,, p. 25.
tetragona	,,	1850.	,, p. 238.
	,,	1851.	,, p. 25.

? SEMICLAUSA, d'Orbigny, 1853.

Diagnosis.

Idmoniidæ with a compound tubular zoarium, with the series of apertures on longitudinal or pinnate ridges. Zoœcial characters as in *Idmonea*.

Type Species.

Semiclausa alternata, d'Orbigny, 1853.

UNREPRESENTED SPECIES.

1. alternata, d'Orbigny, 1853.

Syn. *Semiclausa alternata*, d'Orbigny, 1853–4. Bry. Crét. p. 886, pl. 764, figs. 6–10.
,, ,, Pergens, 1890. Revision, p. 341.

Char.—Ridges pinnate and alternate; each ridge is wedge-shaped, with the apertures in alternate series up to five or six in number.

Distrib.—Neocomian: Sainte Croix, Switzerland.

2. angulosa, d'Orbigny, 1853.

Syn. *Semiclausa angulosa*, d'Orbigny, 1853–4. Bry. Crét. p. 886, pl. 764, figs. 11–13.
,, ,, Pergens, 1890. Revision, p. 341.

Char.—Zoarium a trigonal tube, with the zoarial ridges at the angles. Apertures in rows of five to six.

Distrib.—Senonian or Turonian: Vendôme, Loir-et-Cher.

PHALANGELLA, Gray, 1848.

Synonyms.

Phalangella, Gray (1848), *non* Hamm (1887).
Tubulipora, pars, Lamarck (1816), *non* Lamouroux (1821), Busk (1875), Hincks (1879), etc.
Berenicea, pars, Novak (1877).

DIAGNOSIS.

Idmoniidæ with adnate or suberect, unilaminar zoarium, the margin of which is lobed or entire.

Zoœcia with highly raised peristomes, "disposed more or less irregularly in more or less regular divergent series."

TYPE SPECIES.

Tubipora flabellaris, Fabricius, 1780: Fauna Groenlandica, p. 430.

Phalangella flabellaris, Gray: List Brit. Anim. in Brit. Mus. pt. i. 1848, p. 139.

REMARKS.

The resuscitation of this genus of Gray's is an unfortunate necessity, but a necessity it seems to be. The genus is here accepted for the group for which Busk, Hincks, and other neontologists use the name *Tubulipora*. But that name is ineligible for the following reason. The genus *Tubulipora* was founded by Lamarck [1] in 1816 for seven species of Bryozoa. He did not select any one as a type. Accordingly, in 1821, Lamouroux, who accepted the genus, not unnaturally selected the species that came first in order in Lamarck's series. He only referred to the one species, and thus settled *T. transversa*, Lam., as the type of *Tubulipora*. But that species is now regarded as a young stage of '*Idmonea*' *serpens*, of which it is a synonym. If *Tubulipora* is to be retained it must therefore be used for the group of species which includes '*Idmonea*' *serpens*. This course has been adopted by several authorities on Bryozoa, as *e.g.* Busk [2] in 1875. Hincks,[3] on the contrary, includes the species *serpens* in *Idmonea*, although he retains *Tubulipora*, from which he thus excludes its type species. A third course has been suggested by Dr. Harmer, who remarks that "it is not clear that any generic difference between *Tubulipora* and *Idmonea* can be maintained." [4] There is certainly much to be said in support of that view. But Gray,[5] in 1848, proposed a course which is recommended by its great practical convenience. Recognizing the unsuitability of *Tubulipora* for adnate forms with the apertures in divergent series, he founded the genus *Phalangella.* The members of this genus differ from *Idmonea*, *Crisina*, etc., in that the rows of peristomes are less regular, and are divergent instead of being alternate and transverse.

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[1] Lamarck: Hist. nat. Anim. sans Vert. vol. ii. p. 161.

[2] Busk: Cat. Mar. Polyz. pt. iii., Cycl. pp. 24–27.

[3] Hincks: Brit. Mar. Polyz. 1880, pp. 453, 443.

[4] S. F. Harmer. "On the Development of *Tubulipora*": Quart. Journ. Micros. Soc., new ser., vol. xli. 1898, p. 89.

[5] Gray: Cat. Rad. 1848, p. 139.

The name *Tubulipora* is therefore abandoned, as it has been used in such very diverse senses, and was very imperfectly diagnosed both by Lamarck and Lamouroux. The genus has been accepted by many palæontologists for Berenicoid species with high peristomes, such as Römer's *Tubulipora parca*, von Hagenow's *Tubulipora parasitica*, and d'Orbigny's *Tubulipora fascicularis.* These Bryozoa might be regarded as primitive forms of *Phalangella* if the recent species have been developed from *Berenicea* by—1st, the increase in height of the peristomial portions of the zoœcia, and 2nd, the subsequent arrangement of such highly raised peristomes into regular radiating series. Such an assumption seems doubtful. The Bryozoan which seems the most probable ancestor of *Phalangella* is the *Berenicea radians* of Novak ; in that 'species' the peristomes are high, and the radial, linear arrangement is indicated. It seems better, therefore, to restrict *Phalangella* to those 'species' in which the peristomes occur in somewhat irregular, divergent rows. The genus may thus be regarded as the Berenicoid representative of the Idmoniidæ.

Phalangella radians (Novak), 1877.

Syn. *Berenicea radians*, Novak. 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 98, pl. iv. figs. 15–18.

non Diastopora ,, Pergens & Meunier, 1887. Bry. gar. Faxe : Ann. Soc. malac. Belge, vol. xxi., Mém. p. 200.

,, ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze. sect ii. p. 33.

non ,, ,, Vine, 1889. Polyz. Greensd. : Proc. Yorks. Geol. Soc. vol. xi. p. 266, pl. xii. fig. 9.

Char.—Zoarium discoid, elliptical, or reniform. Zoœcia tapering towards the distal end. Peristomes in fairly regular radial lines. Surface of zoarium punctate.

Distrib.—Cenomanian: Kamajk, Zbislaw, and Jiné, Bohemia, in Korycaner Schichten.

CRISINA, d'Orbigny, 1849.

SYNONYMS.

Crisisina,[1] d'Orbigny (1849).
Crisina, d'Orbigny (1850) ; *non* Gabb & Horn (1862) ; Stoliczka (1864) ; Smitt (1872), etc.
Retepora, *pars*, Goldfuss (1827), etc.
Idmonea (*non* Lamx.), d'Orbigny (1853), Busk (1875), Hincks (1880).
Cœlophyma, *pars*, von Hagenow (1851).
Clavitubigera, *pars*, d'Orbigny (1853), Beissel (1865).
Reptotubigera, *pars*, Bucaille (1890).

DIAGNOSIS.

Zoarium erect; dichotomously branching. No aliform selvage. Fixed by a broad discoid base. Reverse face smooth or punctate. No obverse axial rod.

Zoœcia in regular series, with low and well-raised peristomes.

The apertures are in uniserial rows.

Gonœcia are the usual form of marsupial chamber.

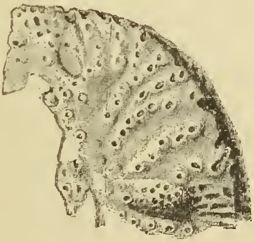

FIG. 11.—The *Phalangella* stage or base of a *Crisina* ; × 8 dia. Middle Chalk : Chatham. Gamble Coll. D. 4242.

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[1] This name was originally spelt *Crisisina*, and d'Orbigny appears subsequently to have used that form and *Crisina* indiscriminately. Thus, in the Index to the Prodrome (vol. iii., Table, p. 51) all the species are referred to *Crisisina*, and *Crisina* is not mentioned, whereas in the text the species are distributed between both names. On the other hand, in the Bry. Crét. *Crisina* only is used in the text, though *Crisisina* appears once on a plate, through an obvious misprint. Some latter authors have accepted *Crisina* and *Crisisina* as two genera. But it appears most probable that the latter term was due to a misprint, by which d'Orbigny sometimes felt bound to stand.

TYPE SPECIES.

Crisina cenomana, d'Orbigny. Prod. Pal. vol. ii. 1850, p. 175. Cenomanian: Le Mans.

AFFINITIES.

The genus *Idmonea* was founded by Lamouroux in 1821 for a single Bathonian species. The zoarium is sessile, and consists of triangular encrusting branches with alternate rows of apertures, and frequently a well-developed selvage. Later workers on the Bryozoa have used the name in a different sense. Busk described the whole of the Idmoniidæ as erect, and d'Orbigny proposed the genus *Reptotubigera*, in which he included the type species of *Idmonea*. *Idmonea triquetra*, which we are bound to accept as the type species of *Idmonea*, presents some striking differences from the later species usually referred to that genus. It is convenient to adopt for them another generic name. D'Orbigny's *Crisina* appears to be the most suitable. It was defined thus: "C'est une *Idmonea*, dont les branches sont libres au lieu d'être fixes." There are other differences, but the character named is the most conspicuous. It is true that d'Orbigny subsequently proposed a fresh distinction between *Crisina* and *Idmonea*, using the former for the species in which there are pores on the reverse surface; and unfortunately Jullien and Stoliczka have accepted *Crisina* in accordance with this later definition. But the pores in question are mere interzoœcial depressions, of no morphological value. That these are, moreover, of little systematic value is rendered probable by d'Orbigny's own use of them. On pl. 614 of his "Cretaceous Bryozoa" three species are figured, all of which are referred to *Crisina*; but in the text of the volume *C. cenomana* (although the only species amongst those originally included in *Crisina* which is available as a member of that genus) is removed to *Idmonea*; and the reverse face of *C. cenomana* is marked by the interzoœcial depressions or pores, which are said to be characteristic of *Crisina* and to be absent from *Idmonea*.

Cœlophyma of von Hagenow was correctly explained by d'Orbigny as *Crisina* showing the gonœcia. *Clavitubigera*, d'Orb., is a *Crisina* with short broad zoarium.

1. **Crisina unipora**, d'Orbigny, 1850.

SYNONYMY.

Crisina unipora, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 613, figs. 1–5.
Idmonea ,, d'Orbigny, 1853. Bry. Crét. p. 737.
non ,, ,, Beissel, 1865. Bry. aachn. Kr.: Nat. Verh. holl. maatsch. Wet. ser. 2, vol. xxii. p. 74, pl. viii. figs. 97–101.
,, ,, Hamm, 1881. Bry. mastr. Ober-Sen. p. 31.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 29.
,, ,, Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 204.
,, ,, Pergens, 1890. Revision, p. 342.
non Crisia ,, Waters, 1884. Cycl. Austr.: Quart. Journ. Geol. Soc. vol. xl. p. 683, pl. xxx. fig. 1.
Crisina elegans, d'Orbigny, 1851. Bry. Crét. pl. 613, figs. 6–10.
Idmonea francorum, Pergens, 1890. Revision, p. 343, pl. xiii. fig. 6.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 308.
? *Retepora gracilis*, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 592, pl. xxiii. *b*, fig. 4.

DIAGNOSIS.

Zoarium of delicate branches, which divide dichotomously at considerable intervals. The branches are subcylindrical in cross section.

Zoœcia long. Apertures are usually single and alternate; but there is occasionally a second aperture beside the principal one. The peristomes are low.

DIMENSIONS.

	Fide Pergens.	B.M. D. 3979.	B.M. D. 963.
Diameter of average branches	·3–·4 mm. ...	·5 mm. ...	·5 mm.
Distance of apertures on one side of branch	variable ...	·8 ,, ...	·8 ,,
Diameter of aperture ...	·09 mm. ...	·1–·13 ,, ...	·1 ,,

DISTRIBUTION.

ENGLAND:
Upper Chalk: Gravesend.
Middle Chalk: Chatham.

FOREIGN:
Senonian—Maastrichtian: Fécamp, Seine-Inférieure; Maastricht; Ciply.
Campanian: Rügen.
Turonian: Vendôme, Loir-et-Cher.

FIGURES.

Pl. VIII. Fig. 5. Part of a typical branch, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3979.**

Pl. VIII. Fig. 6. Branch of another zoarium, seen in Fig. 6*a* from the obverse and in Fig. 6*b* from the side; × 12 dia. In the lower part of this branch the apertures are sometimes biserial. Upper Chalk: Gravesend. Vine Coll. **D. 963.**

AFFINITIES.

This 'species' is the simplest of the *Crisinæ*, and Waters has suggested that it may be a *Crisia.* The Australian specimens, however, referred to the species by Waters seem to me specifically distinct.

The branchlets often retain the uniserial apertures for lengths of several millimetres; a specimen on slide **D. 3979** is 6 mm. long: this shows that the zoœcia are not immature forms of multiserial 'species,' though the tips of the branches in some other *Idmoneæ* are uniserial.

Pergens remarked that the only reason why he did not unite the species described by him as *I. francorum* with *I. unipora* is, that the diameter of the apertures are respectively ·06 and ·09 mm.

LIST OF SPECIMENS.

D. 3979.	Three fragments (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VIII. Fig. 5.
D. 963.	Two fragments (on slide). Upper Chalk. Gravesend. T. R. Jones Coll Purchased in Vine Coll. Figd. Pl. VIII. Fig. 6.
D. 2646.	Four small fragments (on slide). Upper Chalk. Gravesend. T. R. Jones Coll. Purchased in Vine Coll.
D. 445.	Four fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

2. **Crisina cenomana,** d'Orbigny, 1850.

SYNONYMY.

Crisina cenomana, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 175.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 614, figs. 1–5.
Idmonea ,, d'Orbigny, 1853. *Ibid.* p. 732.
,, ,, Pergens, 1890. Revision, p. 344, pl. xii. figs. 3, 13.
,, *disticha* (*non* Goldf.), Michelin, 1845. Icon. Zooph. p. 204, pl. lii. fig. 18.
,, *calypso,* d'Orbigny, 1853. Bry. Crét. p. 733, pl. 747, figs. 10–14.

Reptotubigera calypso, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 507.
Crisina normaniana, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 612, figs. 1–5.
,, ,, d'Orbigny, 1854. *Ibid.* p. 914.
,, ,, Pergens, 1890. Revision, p. 347.
Idmonea ,, Bucaille, 1890. *Op. cit.* p. 510.
Crisisina triangularis, d'Orbigny, 1851. Bry. Crét. pl. 612, figs. 11–15.
Crisina ,, d'Orbigny, 1853–4. *Ibid.* p. 915, pl. 769, figs. 11–14.
Idmonea ,, Pergens, 1890. Revision, p. 348.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 204.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. p. 134.
,, ,, Pergens, 1895. Bry. Cachemb.: Bull. Soc. belge Géol. vol. viii. p. 182.
,, *dorsata*, Vine, 1889. Polyz. Greensd.: Proc. Yorks. Geol. Soc. vol. xi. p. 260.
Crisina ligeriensis, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 614, figs. 11–15.
Idmonea prima, Pocta, 1892. Mech. Koryc. Hory: Cesk. Akad. Cis. Fr. Jos. sect. ii. p. 18, pl. ii. figs. 7–11.

DIAGNOSIS.

Zoarium of dichotomous branches, forming a small tuft. The reverse surface is rounded and convex; the obverse face is a blunt ridge: hence in transverse section the branches appear subtriangular, with a rounded base. The reverse surface is slightly linearly furrowed.

Apertures in curved, vertical rows of from two to five, but generally four; the rows of peristomes form well-raised crests, and the rows are well spaced.

Gonœcium lateral; subspherical; thrice the diameter of the zoœcia.

DIMENSIONS.

	Type form (*fide* Pergens).	Var. *triangularis* (*fide* Pergens).	Var. *normaniana* (*fide* Pergens).	B.M. D. 973.
Diameter of branches	·5 mm.	·5 mm.	·5 mm.	1 mm.
Diameter of zoœcia	·1–·12 ,,	·15 ,,	·16 ,,	·2 ,,
Diameter of apertures	·05 ,,	·05 ,,	·08 ,,	·1–·15 ,,
Distance of peristomial series	·3–·42 ,,	·03[1] ,,	·35–·5 ,,	·7 ,,

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[1] Probably a misprint for ·3.

DISTRIBUTION.

ENGLAND:
Upper Chalk: Kent.
Middle Chalk: Chatham.
Upper Greensand: Cambridge.

FOREIGN:
Senonian — Maastrichtian: Meudon; Sainte-Colombe, Manche; Fécamp; Châteaudun, Eure-et-Loire; Royan.
Santonian: Saintes; L'Arche de Lèves, Chartres.
Coniacian: Villedieu, Villavard, Les Roches, and Vendôme, Loir-et-Cher; Sainte-Paterne and Tours, Indre-et-Loire.
Turonian: Montier, Charente: Les Roches, Loir-et-Cher.
Cenomanian: Le Mans, Sarthe; Île Madame, Charente-Inférieure, in Calcaire à Caprines; Kank, Bohemia, in Korycaner Schichten.

FIGURE.

Pl. VIII. Fig. 7. Part of a zoarium of var. *triangularis*, with a gonœcium at the upper end; seen from the side; × 14 dia. Middle Chalk: Chatham. Vine Coll. **D. 973.**

AFFINITIES.

This Bryozoan resembles *Crisina* (*Retecava*) *geometrica* (Hag.) by the pores traversing the epitheca on the reverse side; it differs from that 'species,' however, by the shape of the transverse section and absence of the reverse axis. Hence it is left in *Crisina*.

The *C. normaniana* is kept distinct by Pergens, although according to his measurements it agrees identically with *C. cenomana*, except in the size of the aperture; but the *normaniana* appears to be a worn basal portion of a zoarium, so that neither the size of the existing aperture nor the median space is more than an individual character.

LIST OF SPECIMENS.

BRITISH.

D. 973.	Two fragments of var. *triangularis*; one has a lateral gonœcium. Middle Chalk. Chatham. Vine Coll. Figd. Pl. VIII. Fig. 7.
D. 444.	Fragments (on slide): var *triangularis*. Middle Chalk. Chatham. Gamble Coll.
D. 3982.	Three fragments (on slide): var. *triangularis*. Middle Chalk. Chatham. Gamble Coll.
D. 2697.	A distal end of branch, with biserial apertures: var. *triangularis*. Middle Chalk. Chatham. Vine Coll.

D. 3132. A biserial fragment of var. *triangularis*. Upper Chalk. Kent. Simmons Coll.

D. 1882. A fragment with apertures in series of 2–3. Upper Greensand. Cambridge. Recorded by Vine as *Idmonea dorsata*. Jesson Coll.

FOREIGN.

D. 3694. Five fragments of zoaria. Craie chloritée. Le Mans. Tesson Coll.

D. 1320. Five imperfect worn specimens (on slide with a fragment of an indeterminable *Entalophora*). Cenomanian: Craie chloritée. Le Mans. Vine Coll.

D. 3727. Two fragments of var. *triangularis*, Orb. (on slide). Senonian. L'Arche de Lèves. Gamble Coll.

D. 4668, D. 4670. Fragments of var. *triangularis*, Orb. (on slides). Turonian: Craie marneuse. North of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4669. Two branches of var. *triangularis*, Orb. (on slide). Senonian—Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4666. A branched fragment of var. *normaniana*, Orb. (on slide). Senonian—Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

3. Crisina marginata (d'Orbigny), 1853.

SYNONYMY.

Idmonea marginata, d'Orbigny, 1853. Bry. Crét. p. 744, pl. 749, figs. 20–23.
,, ,, Pergens, 1890. Revision, p. 344.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. p. 134.
,, *lata*, d'Orbigny, 1853. Bry. Crét. p. 734, pl. 748, figs. 6–10.
,, *excavata*, d'Orbigny, 1853. *Ibid.* p. 742, pl. 749, figs. 11–15.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.

DIAGNOSIS.

Zoarium with dichotomous branches which are flat or concave on the reverse side, ridged or rounded on the obverse.

Zoœcia of medium size. The rows of apertures include from three to eight. Peristomes low.

DIMENSIONS.

	Fide Pergens.
Diameter of branch	1 mm.
Diameter of zoœcia	·14 ,,
Diameter of aperture	·06 ,,
Distance of transverse rows	·3–·34 ,,

Distribution.

England:

Upper Chalk: Bromley.
Middle Chalk: Chatham.

Foreign:

Senonian — Maastrichtian: Sainte - Colombe, Manche; Meudon; Chapet, Seine-et-Oise; Royan.
Santonian: Saintes; L'Arche de Lèves.
Coniacian: Tours, St. Paterne, and Joué, Indre-et-Loire; Vendôme, Lisle, and Villedieu, Loir-et-Cher; in Craie de Villedieu.
Turonian: Angoulême; Merpins; Martigues, Bouches-du-Rhône; Lavardin and Villavard, Loir-et-Cher.

Figures.

Pl. IX. Fig. 6. Part of a zoarium, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 969.**

Pl. IX. Fig. 7. Reverse side of another specimen on the same slide, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 969.**

Affinities.

This species agrees in the general character of its zoarium with *Tervia dorsata* (Hag.), but it has no unpaired apertures, and more regular triangular or subtriangular branches, and more apertures in the transverse series.

LIST OF SPECIMENS.

British.

D. 969. Three fragments of zoaria (on slide). Middle Chalk. Chatham. Vine Coll., No. 24, No. 5G. Figd. Pl. IX. Figs. 6 and 7.

D. 4473. Three fragments of var. *lata* (on slide). Upper Chalk. Bromley. J. Simmons Coll.

D. 4229. One zoarium showing reverse face (on slide with four indeterminable fragments). Middle Chalk. Chatham. Gamble Coll.

Foreign.

D. 2905. Several fragments (on slide). Senonian: Maastrichtian. La Mare, Chapet, Seine-et-Oise. Presented by Prof. T. R. Jones, F.R.S.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **angulosa** (d'Orbigny), 1853.

Syn. *Idmonea angulosa,* d'Orbigny, 1853. Bry. Crét. p. 735, pl. 748, figs. 11–15.
,, ,, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. mal. Belg. vol. xxi., Mém. p. 212.
,, ,, Pergens, 1890. Revision, p. 343.

Char.—Possibly founded on the thin distal ends of branches of *Crisina cenomana*.
Distrib.—Danian: Faxœ. Turonian: Martigues.

2. **convexa** (d'Orbigny), 1853.

Syn. *Clavitubigera convexa*, d'Orbigny, 1853. Bry. Crét. p. 725, pl. 746, figs. 12–15.
Idmonea ,, Pergens, 1890. Revision, p. 346.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. p. 134.
Clavitubigera angustata, d'Orbigny, 1853. Bry. Crét. p. 726, pl. 746, figs. 16–20.
Idmonea ,, Pergens, 1890. Revision, p. 345.

Char.—Zoarium short, simple, somewhat clavate, rising from a discoid base. The reverse face is convex; the obverse face is rounded or raised to a sharp ridge.

Apertures in series of from three to seven; the rows are near together, and reach to the middle line of the obverse face.

Distrib.—Senonian (and ? Turonian): France.

3. **fischeri** (Pergens), 1890.

Syn. *Clavitubigera excavata*, d'Orbigny, 1853. Bry. Crét. p. 727, pl. 747, figs. 6–9.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 398.
Idmonea ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
,, *fischeri*, Pergens, 1890. Revision, p. 345, pl. xii. fig. 4.
,, ,, Pergens, 1890. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii., Proc. Verb. p. 134.

Char.—Allied to *Tervia depressa*, but laterally compressed; branches thicker than wide; six apertures in each transverse series.

Distrib.—Senonian—Maastrichtian: Meudon; Ciply; Maastricht.
Santonian: Arche de Lèves.
Coniacian: Vendôme, Lisle.
Turonian: Lavardin and Villavard.

4. **navicularis** (Beissel), 1865.

Syn. *Clavitubigera navicularis*, Beissel, 1865. Bry. Aach. Kr.: Nat. Verh. Holl. Maat. Wet. ser. 2, vol. xxii. p. 73, pl. viii. figs. 94–96.

Char.—Zoarium short, thick, with a broad, concave reverse face. The apertures in the lateral series vary from three to five; the rows are almost vertical, and their inner ends are separated by a broad, median band.

Distrib.—Senonian: Friedrichberg, near Aachen.

Aff.—The form of the zoarium resembles that of *Tervia convexa*, but the broad median band without apertures on the obverse face clearly separates them. It also resembles *Tervia dorsata*, from which the same character separates it.

5. plana (Pocta), 1892.

Syn. *Idmonea plana*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 19, pl. ii. figs. 1, 2.

Char.—Zoarium broad; apertures in curved rows of about five or six in each; subpinnate in aspect. Peristomes low.

Distrib.—Cenomanian: Kank, Bohemia.

Subgenus **TERVIA**, Jullien, 1882.

Synonyms.

Crisisina, pars, d'Orbigny (1850).
Crisina, pars, d'Orbigny (1851).
Idmonea, pars, d'Orbigny (1853), Pergens (1890), etc.
Clavitubigera, pars, d'Orbigny (1853).
Filisparsa, pars, Marsson (1887).
Reptotubigera, pars, Bucaille (1890).

Diagnosis.

Crisinæ with an open tufted zoarium.

Zoœcia occurring in alternate transverse series with a median, unpaired series scattered along the middle line of the branches.

Type Species.[1]

Tervia solida, Jullien, 1882. Drag. Trav., Bry.: Bull. Soc. zool. France, vol. vii. 1882, p. 501, pl. xvii. figs. 72, 73. Recent: Bay of Biscay.

Affinities.

This subgenus was founded as a genus by M. Jullien[2] on some recent species. The palæontological history of the variation is in favour of its subgeneric value. The oldest species of the subgenus is the *T. subgracilis* (Orb.).

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[1] Jullien described four species, of which *T. solida* appears to be the most suitable type.

[2] Jullien. Dragages du "Travailleur," Bryozoaires: Bull. Soc. zool. France, vol. vii. 1882, p. 500.

1. Crisina (Tervia) subgracilis, d'Orbigny, 1850.

Synonymy.

Crisisina subgracilis,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
Crisina ,,	d'Orbigny, 1851. Bry. Crét. pl. 614, figs. 6–10.
Idmonea ,,	d'Orbigny, 1853. Bry. Crét. p. 738.
,, ,,	Hamm, 1881. Bry. mastr. Ober-Sen. p. 31.
,, ,,	Pergens, 1890. Revision, p. 345, pl. xii. fig. 2.
Reptotubigera ,,	Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.
Clavitubigera depressa,	d'Orbigny, 1852 and 1853. Bry. Crét. p. 726, pl. 747, figs. 1–5.
Idmonea francorum,	Vine, 1893. Rep. Brit. Assoc. 1892, p. 308.
Filisparsa pulchella,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 35, pl. iii. fig. 7.
non ,, ,,	Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 330.

Diagnosis.

Zoarium simple or formed of a few narrow branches, which may dichotomize once or more. The obverse face of the zoarium is well rounded and convex; the reverse is flat, and may be concave. The branches are sometimes swollen distally (var. *Clavitubigera depressa*).

Zoœcia arranged in alternate pairs or triplets, with an irregular series of additional zoœcia along the middle line. Peristomes well raised and usually reflexed at right angles.

Dimensions.

	Fide Pergens.	B.M., D. 968. Branched variety.	B.M., D. 526. Simple, broad variety.
Diameter of a branch	·4 mm.	·6 mm.	·5 mm.
Length of a branch	—	—	·4 ,,
Diameter of zoœcia	·12–·16 ,,	·2 ,,	·2 ,,
Length of raised peristomes	—	—	·4–·5 ,,
Distance of pairs of apertures of same side	·4–·5 ,,	·8 ,,	·4–·85 ,,
Diameter of aperture	·08 ,,	·14 ,,	·1 ,,

Distribution.

British:

Upper Chalk: Gravesend; Bromley.
Middle Chalk: Chatham.

Foreign:

Senonian—Maastrichtian: Maastricht; Meudon; Fécamp, Seine-Inférieure; Sainte-Colombe, Manche; Ciply; Chapet, Seine-et-Oise.
Campanian: Rügen.
Coniacian: Joué, Indre-et-Loire; Vendôme, Loir-et-Cher.

Figures.

Pl. IX. Fig. 4. A small, simple zoarium, of the *depressa* variety, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 526.**

Pl. IX. Fig. 5. Part of a branched zoarium, with worn peristomes; × 18 dia. Upper Chalk: Gravesend. Vine Coll. **D. 968.**

Pl. XI. Fig. 11. Side view of a regular branch with low peristomes, small zoœcia, and a gonœcium; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4068.**

Affinities.

Owing to the presence of a median irregular series of zoœcia, this 'species' belongs to the group for which Jullien has proposed the genus *Tervia.*

Idmonea subgracilis is intermediate between *I. unipora* and *I. dorsata*: it resembles the former by its thin branches, but differs by the constantly biserial apertures, the median series of zoœcia, and the greater prominence of the peristomes.

Pergens includes *Clavitubigera depressa* as a synonym; it represents a clavate branch.

Marsson's *Filisparsa pulchella* appears to be the delicate, distal ends of branches of this species. Typical specimens of *C. subgracilis* have sometimes only uniserial apertures and low peristomes. The specimens in the Museum collection numbered D. 1000 and D. 4499 are indistinguishable from typical *C. subgracilis* and yet appear identical with Marsson's figure. The *pulchella* variety may be a deeper-water form than those from Touraine.

LIST OF SPECIMENS.

British.

D. 526. A small simple zoarium approaching the *Clavitubigera depressa* variety. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. IX. Fig. 4.

D. 968. Seven fragments (on slide). Upper Chalk. Gravesend. Vine Coll. The peristomes are worn down. Figd. Pl. IX. Fig. 5.

D. 4068. A branch with gonœcium (on slide), with *Spiropora cretacea* (Orb.). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XI. Fig. 11.

D. 448. Four zoaria (on slide). Typical variety. Middle Chalk. Chatham. Gamble Coll.

D. 2645. A zoarium (on slide). Typical variety with short peristomes. Middle Chalk. Chatham. Vine Coll.

D. 529. A zoarium with very long peristomes. Middle Chalk. Chatham. Gamble Coll.

D. 447. Three branched zoaria. Middle Chalk. Chatham. Gamble Coll.

D. 2621. A zoarium with short peristomes. Middle Chalk. Chatham. Vine Coll., No. 36.

D. 967. Three branched zoaria. Middle Chalk. Chatham. Vine Coll., No. 20.

D. 4496. A small fragment. Upper Chalk. Gravesend. (T. R. Jones Coll.) Vine Coll. The specimen is hardly long enough for the determination to be free from doubt.

D. 974. Two fragments (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Idmonea francorum* by Vine: Rep. Brit. Assoc. 1892, p. 330.

D. 2837. Two zoaria (on slide). Upper Chalk. Bromley. Simmons Coll.

Var. *pulchella* (Mars.).

D. 1000. A small fragment (on slide). Upper Chalk. Gravesend. Vine Coll.

D. 4499. A longer fragment (on slide). Upper Chalk. Bromley. Simmons Coll.

D. 4498. A fragment showing reverse side (on slide). Upper Chalk. Kent. Simmons Coll.

Foreign.

D. 7060. Two fragments (on slide). Senonian. La Mare, Chapet, Seine-et-Oise. Presented by Professor T. R. Jones.

2. Crisina (Tervia) dorsata (von Hagenow), 1851.

Synonymy.

Idmonea dorsata, von Hagenow, 1851. Bry. Maastr. Kr. p. 31, pl. ii. fig. 10.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
,, ,, d'Orbigny, 1853. Bry. Crét. p. 739, pl. 748, figs. 16–19.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
non ,, ,, Vine, 1885. Notes Cambr. Greensd.: Proc. Yorks. Geol. Polyt. Soc., new ser., vol. ix. p. 14.
,, ,, var. *faxeensis*, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. Bry. malac. Belg. vol. xxi. p. 216, pl. xi. fig. 1.
,, ,, *pars*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 28.
on ,, ,, Vine, 1889. Polyz. Greensd.: Proc. Yorks. Geol. Soc. vol. xi. p. 260.
,, ,, *pars*, Pergens, 1890. Revision, p. 344, pl. xii. fig. 5.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 204.

Reptotubigera dorsata, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.

Retepora disticha, *pars*, Goldfuss, 1827. Petref. Germ. vol. i. p. 30, pl. x. figs. 15*g*, *h*.

Diagnosis.

Zoarium of dichotomous branches, which are flat and broad; the breadth ranges up to 3 or 3½ mm. The obverse face is convex and well rounded; the reverse is concave. By a deepening of the concavity on the reverse face, and the curling backward of the lateral edges, which may nearly meet posteriorly, the zoarium becomes almost cylindrical with a hollow axis.

Zoœcia arranged in series which, for this genus, are somewhat irregular. The lateral series number from two or three to eight zoœcia on each side. The transverse series are prominent and well spaced; the unpaired Tervian apertures are irregular and few in number.

Dimensions.

	Fide Pergens.	B.M., D. 3601.
Breadth of zoarium	—	3–3·5 mm.
Thickness of zoarium	1–1·3 mm.	1·5–2 ,,
Diameter of zoœcia	·22–·26 ,,	·17 ,,
Diameter of aperture	·08–·09 ,,	·12 ,,
Distance of transverse series on same side	·5–·75 ,,	·75 ,, (average)

Distribution.

Danian: Faxoe and Stevn's Klint.
Senonian—Maastrichtian: Maastricht, St. Pierre, Falkenberg, and Heer.
Campanian: Rügen.
Santonian: L'Arche de Lèves.
Coniacian: Luynes and St. Paterne, Indre-et-Loire.

Affinities.

The form of the zoarium in this species is interesting from two characters. The bending backward of the edges and partial concealment of the reverse surface within an almost complete tube gives the zoarium a Biflustrine form. If the tube had been completed the zoarium would have been hardly distinguishable from hollow *Spiroporæ*.

D'Orbigny's figures illustrate the occurrence of the unpaired median zoœcia, which assign this 'species' to the group *Tervia.* Marsson includes as one of the synonyms *I. calypso*, Orb., which is more probably a synonym of *Crisina cenomana*, as it has been treated by Pergens.

LIST OF SPECIMENS.

Foreign.

D. 1370. Two fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3601. Two irregular, isolated zoaria (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3545. Two flatter and more regular zoaria (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3544. Three fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3354. Part of a zoarium, with well-developed peristomes. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3730. Two fragments (on slide). Senonian. L'Arche de Lèves. Gamble Coll.

D. 6432. Four fragments (on slide). Maastrichter Kreide. St. Pierre. Busk Coll.

3. Crisina (Tervia) gibbera,[1] n.sp.

Diagnosis.

Zoarium with the branches well rounded on obverse side, and flattened on reverse side, on which occur isolated, thick, spine-like processes. The height of the processes is about half the thickness of the branches at the base; they are as broad as the distance between two adjacent lateral series of apertures and taper to a sharp point.

Apertures large, about three in each transverse series. The Tervian apertures are single, and one occurs usually half-way between the transverse series.

Dimensions.

Diameter of branch	1	mm.
Diameter of zoœcia	·16–·25	,,
Diameter of aperture	·1–·16	,,
Length of reverse spinal processes	·5–·7	,,

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[1] *Gibber*, 'humped.'

DISTRIBUTION.

Senonian—Maastrichtian: Bemelen.

FIGURE.

Fig. 12. Branch from the side showing processes, × 6 dia. Maastrichter Kreide: Bemelen. Busk Coll. **D. 6429.**

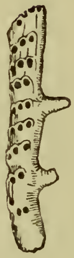

FIG. 12.—*Crisina* (*Tervia*) *gibbera*, nov.

AFFINITIES.

This species agrees in general characters with *Tervia dorsata*, but has a series of dorsal processes on the reverse side. Pergens figured a specimen with these processes (Revision, pl. xii. fig. 5), and there is another specimen in the Busk Coll. (**D. 6429**). Pergens figured only the reverse side of his specimen, so that its zoœcial characters are not shown. As the specimen in the Busk Collection has fewer zoœcia in the lateral series, and a more prominent Tervian series than *T. dorsata*, the form may be conveniently regarded as a distinct species. Dorsal processes also occur in *Crisina gibbosa*, as which the Busk specimen was identified; but the characters of the obverse surface are quite different.

D. 6429. A branch (on slide). Maastrichter Kreide. Bemelen. Busk Coll. Figd. No. 12.

4. Crisina (Tervia) gamblei, nov.

DIAGNOSIS.

Zoarium small, of dichotomous branches, which are laterally much compressed. The reverse surface is narrow, and longitudinally marked.

Apertures in series of four or five; the series are subalternate. The median unpaired series is very irregular, and the irregularity in places affects the innermost of the serial zoœcia. Peristomes well raised.

DIMENSIONS.

Diameter of branch	·8–1 mm.
Diameter of zoœcia	·17 ,,
Diameter of aperture	·07–·12 ,,
Distance of the series of apertures ...	·4–·7 ,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURE.

Pl. IX. Fig. 9. The obverse face of a zoarium, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4069.**

AFFINITIES.

The specimen, on which this species is founded, was sent by Mr. Gamble to M. Pergens, who added in a manuscript note on the back of the slide: "not *Idmonea cypris*, d'Orb. I think n.sp." The form differs from *Retecava cypris* by the lateral compression of the branches; but the essential difference is that in *I. cypris* the rows of apertures are far nearer together and more regular. This Bryozoan is nearer to *Crisina* (*Tervia*) *dorsata*, but differs from it by the narrowness of the reverse surface and less regular arrangement of the apertures. It also agrees in some respects with *Tervia muelleri* (Beissel), in which, however, the lateral apertures are fewer and the series are more widely separated.

D. 4069. Three fragments (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. IX. Fig. 9.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **decurrens** (Pocta), 1892.

SYN. *Idmonea decurrens*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 18, pl. ii. figs. 3–6.

CHAR.—Zoarium of simple triangular branches. Apertures in alternate pairs and triplets with a regular median series. Peristomes low.

DISTRIB.—Cenomanian: Kank, Bohemia.

2. **muelleri** (Beissel), 1865.

SYN. *Idmonea muelleri*, Beissel, 1865. Bry. Aach. Kr.: Nat. Verh. Holl. Maat. Wet. ser. ii. vol. xxii. p. 77, pl. ix. figs. 105, 106.
Filisparsa ,, Beissel, 1865. *Op. cit.* p. 84, pl. x. figs. 129–131.
,, *simplex*, von Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 134, pl. xxv. fig. 1.
? ,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 35.

CHAR.—Branches long and narrow; lateral series of one, two, or three zoœcia; lateral rows subalternate or even opposite in places. Reverse side well rounded. Median zoœcia may open immediately between the apertures of a pair of lateral zoœcia or half-way between one pair of lateral apertures and the next pair.

DISTRIB.—Senonian: Friedrichberg, near Aachen, in Kreidemergel; ? Rügen.
Turonian: Strehlen and Weinböhla, Saxony, in Upper Pläner.

Subgenus **RETICRISINA**, nov.

SYNONYMS.

Reticulipora (*non* Haime), d'Orbigny (1850), Marsson (1887), Pergens (1890), etc.
Retepora, *pars*, Goldfuss (1827), etc.
Ceriopora, *pars*, von Hagenow (1839).
Idmonea, *pars*, de Blainville (1830), Marsson (1887), etc.
Stichopora, d'Orbigny (1851, *non* 1852).
Tubigera, *pars*, d'Orbigny (1853).
Pustulopora, *pars*, Römer (1840).

DIAGNOSIS.

Crisinæ in which the branches are laterally extremely compressed, and the zoarium is generally reticular. The apertures occur in long, vertical, sometimes curved series, extending nearly or wholly across the lateral face of the branches. There is no reverse axis, and the reverse face may be rudimentary.

TYPE SPECIES.

Reticulipora obliqua, Orb., 1850. Senonian.

AFFINITIES.

This subgenus includes a group of species which have hitherto been referred to the genus *Reticulipora*. That genus was founded by d'Orbigny[1] in 1849 for the *Apsendesia dianthus* of de Blainville, which is a Bathonian species. The structure of *Reticulipora dianthus* appears to me very different from that of the Cretaceous species assigned to the genus. The Jurassic species is composed of closely packed zoœcia, with subpolygonal, crowded apertures, and of a numerous series of dactylethræ. The only resemblance between *R. dianthus* and the Cretaceous species called '*Reticulipora*' is in the retiform or pinnate shape of the zoarium. But as the zoœcial characters are different, it seems necessary to separate the two groups into different families.

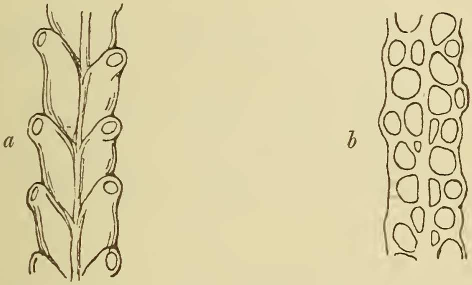

FIG. 13.—*Reticrisina obliqua* (Orb.). Middle Chalk. Chatham. Gamble Coll. D. 3956. FIG. 13*a*.—Vertical longitudinal section, × 26 dia. FIG. 13*b*.—Horizontal transverse section, × 26 dia.

In *Reticrisina* the apertures occur as long vertical rows, and the zoœcia are monomorphic. In *Reticulipora* the apertures are limited to the obverse edge, and the whole of the lower part of the branches is occupied by crowded, irregularly or quincuncially arranged angular zoœcia, most of which are aborted to the condition of dactylethræ. The genus, in fact, resembles *Retelea* rather than *Reticrisina*.

D'Orbigny clearly recognized the affinity of the Bryozoa that he figured as *Reticulipora* to *Crisina*; he placed them in the same family, but separated them by their modes of growth. In *Crisina*, according to d'Orbigny, growth is only terminal; whereas in his '*Reticulipora*' it is lateral as well as terminal. But at the distal ends of most *Crisinæ* there are fewer zoœcia in the transverse series than at the proximal parts of the zoarium. The increase in the older regions must be due to lateral growth, so that the character appears useless. In any case '*Crisina disticha*' (Goldf., *pars*) must grow laterally, and would differ only from the Chalk *Reticrisinæ* by being less laterally compressed.

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[1] D'Orbigny: Rev. Mag. Zool. ser. 2, vol. i. p. 501.

The latter are probably deep-sea allies of *Reticrisina disticha*.

1. Crisina (Reticrisina) obliqua (d'Orbigny), 1850.

Synonymy.

Reticulipora obliqua, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 264.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 610, figs. 1–5, fig. 6?
,, ,, d'Orbigny, 1853–4. *Ibid.* p. 906, pl. 768, figs. 1, 2.
,, ,, Brauns, 1875. Sen. Salzb.: Zeit. Ges. Naturw. vol. xlvi. p. 401.
,, ,, Pergens, 1890. Revision, p. 355.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 205.
Diastopora reticulata, Vine, 1884. Fourth Report: Rep. Brit. Assoc. 1883, p. 168.

Diagnosis.

Zoarium an irregular network, consisting of a crowded series of radial pinnate branches. The branchlets are opposite and project distally, and unite with the branchlets of the adjacent branches. The posterior surface is flattened and the general aspect is regular; but owing to the irregular vertical growth the anterior surface appears irregular and often mæandriform.

The meshes are flamboyant, lanceolate, hexagonal, or irregular. Zoœcia small and very numerous. The number of apertures in a vertical series ranges from nine (excluding young and immature branchlets) to more than forty.

Dimensions.

	Fide Pergens.	B.M., D. 3954.
Thickness of branch	— ...	1 mm.
Height of branch	3–7 mm. ...	4–5 ,,
Diameter of zoœcia	·16 ,, ...	·2–·3 ,,
Diameter of aperture	·07 ,, ...	·1–·25 ,,
Distance of series of peristomes ...	— ...	·4–·7 ,,

Distribution.

England:

Upper Chalk: Sussex; near Maidstone; Dover; Beachy Head.
Middle Chalk: Chatham.

FOREIGN :

Senonian—Maastrichtian : Sainte-Colombe, Manche ; Fécamp, Seine-Inférieure ; Royan, Charente-Inférieure.
Santonian : Saintes, Charente-Inférieure ; Salzberg, near Quedlinburg.
Coniacian : Tours, Joué, Luynes, Ste. Paterne, etc., Indre-et-Loire ; Villedieu, Lisle, Vendôme, etc., Loir-et-Cher.
Turonian : Martigues, Bouches-du-Rhône ; Merpins, Charente ; Lavardin, Loir-et-Cher ; Moutiers, Charente.
Turonian or Coniacian : Les Roches.

FIGURES.

Pl. VIII. Fig. 8. A zoarium with flamboyant meshes ; natural size. Upper Chalk : Sussex. Dixon Coll. **60,254.**

Pl. VIII. Fig. 9*a*, part of a zoarium, from reverse face, × 2 dia. ; Fig. 9*b*, part of side view of the same, × 11 dia. Middle Chalk : Chatham. Gamble Coll. **D. 3954.**

Fig. 13, p. 177. Two sections across a zoarium imbedded in flint. Fig. 13*a*, part of a vertical section, showing the zoarial lamina and lateral zoœcia ; × 26 dia. Fig. 13*b*, part of a horizontal section, showing the arrangement of the zoœcial cavities ; × 26 dia. Middle Chalk : Chatham. Gamble Coll. **D. 3956.**

AFFINITIES.

This 'species' is characterized by the great number and small size of its zoœcia.

LIST OF SPECIMENS.

BRITISH.

D. 3954. A zoarium on flint. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. VIII. Figs. 9*a*, *b*.

60,254. Two zoaria, one with very irregular branches, with large flamboyant interspaces. Upper Chalk. Sussex. Dixon Coll. Figd. Pl. VIII. Fig. 8.

D. 3956. A specimen imbedded in flint. Middle Chalk. Chatham. Gamble Coll. And a section across the same. Figd. Figs. 13*a*, *b*, p. 177.

D. 3040. A flat, flabellate zoarium, 60 mm. broad by 45 mm. high. Chalk. England. Daniels Coll.

D. 3044. An irregular zoarium. Upper Chalk. Dover. Bowerbank Coll.

D. 3041. A fan-shaped zoarium, 40 mm. high Chalk. England. Old Coll.

D. 3042. A zoarium with a very irregular, uneven surface. Upper Chalk. Dover. Bowerbank Coll.

D. 483. A broken zoarium. Middle Chalk. Chatham. Gamble Coll.

D. 2999. A zoarium with irregular, unequal interspaces, into which project short crossbars; the form closely resembles that figured by d'Orbigny: Bry. Crét. pl. 610, fig. 2. Upper Chalk. England. Toulmin Smith Coll.

D. 3953, D. 3955, D. 3957. Three fragments of zoaria. Middle Chalk. Chatham. Gamble Coll.

D. 469. Part of a zoarium in flint. Middle Chalk. Chatham. Gamble Coll.

D. 3045. A fragment of a zoarium. Middle Chalk. Chatham. Vine Coll.

D. 2751. Slide with three fragments of zoaria. Middle Chalk. Chatham. Vine Coll.

D. 2696. Slide with four fragments of zoaria. Middle Chalk. Chatham. Vine Coll.

D. 3043. An imperfect zoarium. Upper Chalk. Dover. Bowerbank Coll.

D. 672. Two fragments on slide. Middle Chalk. Chatham. Vine Coll., No. 29.

D. 673. Two fragments on slide. Middle Chalk. Chatham. Vine Coll., No. 29.

D. 384. Three fragments of larger zoarium on slide. Middle Chalk. Chatham. Gamble Coll.

D. 675. Two fragments on slide. Middle Chalk. Chatham. Vine Coll., No. 30. Identified by Vine as *Reticulipora complanata*, Marsson, but the transverse series of apertures are in a continuous series, not scattered.

D. 4165. Two specimens of imperfect young zoaria on flint. Middle Chalk. Chatham. Gamble Coll.

B. 1252. A medium-sized zoarium. Chalk. Loc.? Presented by C. Westendarp, Esq., 1884.

D. 3069. A zoarium with *Desmeopora semicylindrica* (Röm.). Upper? Chalk. Near Maidstone. Toulmin Smith Coll.

Foreign.

D. 4006. Part of a zoarium. Senonian. Ste. Paterne. Gamble Coll.

2. Crisina (Reticrisina) papyracea (d'Orbigny), 1850.

Synonymy.

Reticulipora papyracea, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
,, ,, d'Orbigny, 1851–4. Bry. Crét. p. 907, pl. 611, figs. 1–5; pl. 768, figs. 3–10.
,, ,, Pergens, 1890. Revision, p. 355.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. p. 135.
Idmonea ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.
Reticulipora complanata, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 36, pl. iii. fig. 10.

Diagnosis.

Zoarium dichotomously branched: the branches anastomose occasionally; but the zoarium usually remains loose and open, and rarely occurs as a definite regular network. The branches taper rapidly towards their extremities. On the reverse edge there are often some irregularly distributed zoœcia with prominent peristomes.

Zoœcia small. The number of apertures in a vertical series is small, ranging from five to seven. The series are irregular and broken.

Dimensions.

	Fide Pergens.	B.M., D. 3965.
Diameter of branch	—	·5–·7 mm.
Diameter of zoœcia	·14 mm.	·2 ,,
Diameter of aperture	·06 ,,	·1–·12 ,,
Distance of peristomial series	—	·35–·6 ,,

Distribution.

England:

Upper Chalk: Bromley, Kent.
Middle Chalk: Chatham; Freshwater, Isle of Wight (? zone of *Holaster planus*).

Foreign:

Senonian — Maastrichtian: Meudon; Fécamp, Seine-Inférieure; Châteaudun, Eure-et-Loir.
Campanian: Rügen.
Santonian: L'Arche de Lèves.

Figures.

Pl. IX. Fig. 1. A forked branch of a zoarium. Fig. 1*a*, the obverse edge, × 10 dia.; Fig. 1*b*, side view, × 10 dia.; Fig. 1*c*, the reverse edge, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3965.**

Pl. IX. Fig. 2. The reverse edge of a specimen of var. *complanata*; × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 385.**

Pl. IX. Fig. 3. A young zoarium, × 2 dia. Chalk: Freshwater, I. of Wight. J. S. Gardner Coll. **B. 70.**

Affinities.

This species is marked by the looseness of the zoarium and the small number of apertures in the vertical series. The adult zoarium is thus easily distinguished from *R. obliqua*, but fragments of the young zoaria of the two species are not easily separated. The zoarium of *R. papyracea* is tufted rather than reticular; but some zoaria, such as that represented by Pl. IX. Fig. 3, tend to grow into rather nodular zoaria, like the mæandriform zoaria of *Diastopora michelini* (Blv.).[1]

The occurrence of the scattered apertures on the reverse edge presents an approximation to the rudimentary character of that edge in *Reticrisina disticha* (Gldf.).

LIST OF SPECIMENS.

D. 3965. Two fragments of zoaria. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. IX. Figs. 1*a–c*.

D. 385. Four fragments of young zoaria of the var. *complanata.* Middle Chalk. Chatham. Gamble Coll. The reverse edge of one specimen, showing the irregular series of zoœcia, is figured on Pl. IX. Fig. 2.

B. 70. A young zoarium. Middle Chalk (? zone of *Holaster planus*). Freshwater, I. of Wight. J. S. Gardner Coll. Figd. Pl. IX. Fig. 3.

D. 3046. Parts of a large zoarium in flint. Upper Chalk. Bromley. J. Simmons Coll.

D. 2752. A fragment of young zoarium on slide, the var. *complanata.* Middle Chalk. Chatham. Vine Coll.

D. 674. Two fragments on slide. Middle Chalk. Chatham. Vine Coll , No. 28. Identified by Vine as *R. papyracea.*

3. **Crisina (Reticrisina) disticha** (Goldfuss), 1827.

Synonymy.

Retepora disticha, *pars*, Goldfuss, 1827. Petref. Germ. vol. i. p. 29, pl. ix. figs. 15*c*, *d*, and ? figs. 15*i*, *k*; not figs. 15*a*, *b*, *e–h*.

,, ,, *pars*, Morren, 1829. Descrip. Cor. foss. Belge : Ann. Acc. Groning. 1828, p. 36.

,, ,, *pars*, Kloden, 1834. Verst. Brandenb. p. 264.

,, ,, Milne Edwards, 1836. In Lamarck, Hist. nat. Anim. sans Vert., 2nd ed., vol. ii. p. 281.

,, ,, *pars*, von Hagenow, 1839. Mon. Rüg. : Neu. Jahrb. 1839, p. 281.

Idmonea ,, *pars*, de Blainville, 1830. Zooph. : Dict. Sci. nat. vol. lx. p. 385.

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[1] Cat. Jur. Bry. p. 124.

Idmonea disticha, *pars*, de Blainville, 1834. Man. Act. p. 420.
non ,, ,, Michelin, 1845. Icon. Zooph. p. 204, pl. lii. fig. 18.
non ,, ,, von Reuss, 1847. Foss. Polyp. Wien.: Naturw. Abh. vol. ii. p. 45, pl. vi. figs. 29–31.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 30, pl. ii. fig. 8.
non ,, ,, Seguenza, 1880. Formaz. terz. Regg.: Atti R. Acc. Linc. ser. 3. Mem. vol. vi. p. 132.
,, ,, Hamm, 1881. Bry. mastr. Ob -Sen. p. 31.
,, ,, *pars*, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. roy. malac. Belg. vol. xxi. p. 213.
,, ,, Pergens. 1890. Revision, p. 347.
,, *alternans*, Römer, 1840. Verst. nordd. Kr. p. 21.
,, *maculata*, *pars*, von Hagenow, 1851. *Op. cit.* p. 27, pl. ii. figs. 3*e*, *f*, *g* (*non a–d*).
Retecava ,, *pars*, Hamm, 1881. *Op. cit.* p. 32.
Tubigera distiqua, d'Orbigny, 1853. Bry. Crét. pl. 746, figs. 2–6.
,, *disticha*, d'Orbigny, 1853. *Ibid.* p. 723.
Ceriopora subcompressa, von Hagenow, 1839. Mon. Rüg.: Neu. Jahrb. 1839, p. 284.
,, ,, von Hagenow, 1845. In Geinitz, Grundr. Verst. p. 598, pl. xxiii. *b*, fig. 15.
Pustulopora ,, Römer, 1840. Verst. nordd. Kr. p. 21.
Idmonea ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 28, pl. ii. fig. 7.
Stichopora regularis, d'Orbigny, 1851. Bry. Crét. pl. 613, figs. 11–15.
Seriatopora antiqua, *pars*, Defrance, 1827. Dict. Sci. nat. vol. xlviii. p. 496.
Tubigera ,, d'Orbigny, 1853. Bry. Crét. p. 722, pl. 746, fig. 1.
,, *distans*, d'Orbigny, 1853. Bry. Crét. p. 724, pl. 746, figs. 7–11.

DIAGNOSIS.

Zoarium of laterally much compressed branches, which divide dichotomously; the sub-branches may anastomose into a reticular network. The branches in transverse section are biconvex. The bare reverse surface is rudimentary.

Apertures in series which extend almost round the branches, the reverse side being reduced to a narrow line. The transverse series include from about six up to fifteen zoœcia. Near the reverse edge a few additional zoœcia may occur. The transverse series are subalternate.

Gonocyst a long ovoid chamber on the reverse surface.

DIMENSIONS.

	B.M., D. 3355.
Breadth of a branch	·5 mm.
Thickness of a branch	·2 ,,
Diameter of zoœcia	·15 ,,
Diameter of aperture	·08–·11 ,,
Distance of transverse series	·5 ,,

DISTRIBUTION.

Danian: Faxoe.
Senonian — Maastrichtian: Maastricht; Meudon; Chapet, Seine-et-Oise.
Campanian: Rügen.
Coniacian or Turonian: Les Roches, Loir-et-Cher.
Turonian: Lisle and Vendôme, Loir-et-Cher.

FIGURE.

Fig. 14. A broken gonocyst on the reverse edge of a zoarium, × 16 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 3752.**

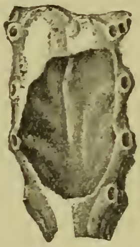

FIG. 14.—*Crisina* (*Reticrisina*) *disticha* (Goldf.).

AFFINITIES.

This species has usually been treated as a normal '*Idmonea*,' and therefore no close comparison has been made between it and the species referred to '*Reticulipora*.' It seems, however, to be a very close ally of the Cretaceous species hitherto assigned to *Reticulipora*. Its nearest ally is *Reticrisina papyracea* (Orb.), from which it differs in the rudimentary character of the reverse edge. From *R. obliqua* it differs in the smaller number of zoœcia in each transverse series.

The figures of Goldfuss are here accepted as interpreted by von Hagenow, as has been generally done; but I cannot avoid a suspicion that Goldfuss' figure, Pl. IX. Figs. 15*c*, *d*, represents a fragment of *Crisina marginata*. Waters[1] has included von Hagenow's *disticha* in an Australian species, *Idmonea bifrons*, Wat., which, however, has only slightly compressed branches.

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[1] Waters. Foss. Cycl. Austr.: Quart. Journ. Geol. Soc. vol. xl. 1880, p. 685.

LIST OF SPECIMENS.

D. 3752. Four fragments (on slide). One specimen shows a large gonocyst. Maastrichter Kreide. Maastricht. Van Breda Coll. Figd. No. 14.

D. 3355. Three fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3541. Thirty fragments. Maastrichter Kreide. Maastricht. Van Breda Coll.

D 3352. A dozen fragments and broken zoaria. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3358. A branched fragment (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 1374. A fragment of a young zoarium in the stage of *I. maculata*, Hag. (Hagenow, Bry. Maastr. Kr. pl. ii. figs. 3*e–g*), on slide. Maastrichter Kreide. Maastricht. Vine Coll.

D. 6433. A fragment (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

D. 7061. Several fragments (on slide). Senonian—Maastrichtian: La Mare, Chapet, Seine-et-Oise. Presented by Professor T. R. Jones.

4. Crisina (Reticrisina) ligeriensis (d'Orbigny), 1850.

Synonymy.

Reticulipora ligeriensis, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 264.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 609, figs. 1–5 (6 ?).
,, ,, d'Orbigny, 1854. *Ibid.* p. 905.
,, ,, Pergens, 1890. Revision, p. 355.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 205.
,, *girondina*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 609, figs. 7–12.
,, ,, d'Orbigny, 1854. *Ibid.* p. 906.
,, ,, Pergens, 1890. Revision, p. 355.

Diagnosis.

Zoarium broad, frondose, undulating. Network fairly regular, and no sharp separation into primary and secondary branches. The interspaces are fairly uniform in size; they mainly appear hexagonal or rhomboidal on the posterior surface, and square, rhomboidal, or irregular on the anterior.

Zoœcia from five to seven or eight, in a vertical series.

(According to Pergens, "la caractéristique de cette espèce est la production de petites surfaces rhomboïdales à la terminaison des zoécies.")

DIMENSIONS.

	Fide Pergens.
Diameter of zoœcia	·2 mm.
Diameter of aperture	·06 ,,

DISTRIBUTION.

FOREIGN :

Senonian—Maastrichtian : Sainte-Colombe, Manche ; Royan.
Santonian : Saintes, etc., Charente-Inférieure.
Coniacian : Tours, Ste. Paterne, and Joué, Indre-et-Loire ; Villedieu, Loir-et-Cher.
Turonian or Coniacian : Les Roches, Loir-et-Cher.

AFFINITIES.

The zoarial characters of this species are very different from those of *R. obliqua* : in this species the aspect is Fenestellid, whereas in *R. obliqua* it is rather that of *Ramipora* ; but one of the specimens figured by d'Orbigny as *R. obliqua* (viz., pl. 610, fig. 6) has the meshes of the same shape as in the Museum specimen referred to *R. ligeriensis*. *R. girondina* is a variety with square meshes. The zoarial characters of this species are very similar to those of *Retecava clathrata* ; but the apertures are not confined, as in *Retecava*, to the anterior part of the zoarium.

LIST OF SPECIMENS.

? **42,817.** Calcare psammitico. De Castello.

? **42,818.** Calcare psammitico. Merone.

Two specimens showing dorsal surfaces of two reticular Bryozoa are labelled *R. ligeriensis*. But they are only casts in a sandstone, and are generically indeterminable.

D. 1046. A broken zoarium 25 mm. broad by 27 mm. high. Senonian. France. Old Coll.

UNREPRESENTED SPECIES.

gradata (Leymerie), 1851.

SYN. *Cricopora gradata*, Leymerie, 1851. Type Pyren. par. à Craie : Mém. Soc. géol. France, ser. 2, vol. iv. p. 191, pl. ix. fig. 7.

CHAR.—Branches laterally greatly compressed : apertures in curved rows of about nine in a series, forming well raised ridges.

DISTRIB.—Senonian—Maastrichtian : Bois de la Barade, near Gensac, Haute-Garonne, in Calcaire à Orbitolites.

RETECAVA, d'Orbigny, 1854.

SYNONYMS.

Retecava, d'Orbigny (1854), Hamm (1881), etc.
Retepora, pars, Goldfuss (1827), M. Edwards (1836).
Idmonea, pars, von Hagenow (1851).
Reticulipora, pars, d'Orbigny (1850).
Reteporidea, d'Orbigny (1849), *non* d'Orbigny (1850).
Crisina, pars, d'Orbigny (1854).
Crisidmonea, Marsson (1887).

DIAGNOSIS.

Crisinæ in which the zoarium is erect and formed of laterally compressed branches. The branches divide dichotomously or irregularly, or are pinnate. The sub-branches may remain free or may unite into a reticular network.

Apertures in the transverse series are numerous and regular. No unpaired median series. The reverse side is occupied by an axial rod formed of rudimentary zoœcia and the distal ends of zoœcia ('canaux de renforcement' of Pergens).

TYPE SPECIES.

Retepora clathrata, Goldfuss, 1827. Maastrichtian: Maastricht.

AFFINITIES.

This genus was founded by d'Orbigny for a single species described by Goldfuss as a *Retepora*. From d'Orbigny's account it is clear that he considered its main character to be the existence of the "côté germinale longitudinale"; but for reasons stated on p. 129 the value of this character is doubtful, and the genus is here accepted on account of the axial rod or thickening on the reverse edge. This structure occurs also in Marsson's *Crisidmonea*, and it seems to offer the best chance of the generic separation of the *Retecava-Crisidmonea* series from *Crisina*. Marsson, however, attached more value to the successive calcareous laminæ which occur on the surface of the zoarium, as the main feature of *Crisidmonea*. That these layers are equally well developed in *Retecava clathrata* is shown by a section figured on p. 189.

The genus *Reteporidea* has also to be included as in part a synonym of *Retecava*; for it was founded by d'Orbigny[1] in 1849 on *R. lichenoides*, Goldf., though at a later period he referred that species to *Idmonea*, and used *Reteporidea* differently.[1] Hence, as explained subsequently, it is better to retain *Retecava* than *Reteporidea*.

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[1] D'Orbigny. Gen. nouv. Bry.: Rev. Mag. Zool. ser. 2, vol. i. p. 500.

Retecava is perhaps the most specialized genus of Idmoniidæ.

1. **Retecava clathrata** (Goldfuss), 1827.

Retepora clathrata, Goldfuss, 1827. Petref. Germ. p. 29, pl. ix. figs. 12*c*, *d*, *non a*, *b*, *e*, *f*.
,, ,, Morren, 1829. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 35.
,, ,, Edwards, 1836. In Lamark, Hist. Nat. Anim. sans Vert., 2nd ed., p. 282.
Reticulipora ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 264.
Idmonea ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 27, pl. ii. fig. 2.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
Retecava ,, d'Orbigny, 1853-4. Bry. Crét. p. 1026, pl. 790, figs. 5–9.
,, ,, Winkler, 1864. Musée Teyl.: Cat. Pal. livr. ii. p. 209.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 32.
,, ,, Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.
,, ,, Pergens, 1890. Revision, p. 356.
,, ,, Pergens, 1894. Nouv. Bry. Limb.: Bull. Soc. belge Géol. vol. vii., Mém. p. 173.
Reticulipora ramosa, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 610, figs. 7–11.
? *Idmonea verriculata*, von Hagenow, 1851. Bry. Maastr. Kr. p. 28, pl. ii. fig. 5.
? *Neuropora cretacea*, von Hagenow, 1851. *Ibid.* p. 48, pl. iii. fig. 10 (*fide* Pergens).

DIAGNOSIS.

Zoarium forming a network which is fairly flat. The meshes are very irregular, varying from elliptical to oblong, trapezoidal, or irregular. The reverse surface is fairly rounded; the obverse surface is strongly carinate; with a median zoarial lamina, separating the two lateral series of crowded zoœcia.

Zoœcia of medium size; the apertures open in curved transverse series of from six to eight in a series. Below the apertures the sides of the branches are covered by an epitheca, the surface of which is marked by numerous pores. The height of the lateral epitheca varies from half-way up the branches almost to the top.

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[1] *Ibid.* p. 936.

DISTRIBUTION.

Senonian—Maastrichtian: Meudon, near Paris; Orglandes? and Sainte-Colombe, Manche; Ciply; Maastricht, St. Pierre, and Fauquemont.

FIGURE.

Fig. 15. A transverse section across a stem, showing the epitheca and zoarial lamina; × 18 dia. Maastrichter Kreide: Maastricht. **60,163.**

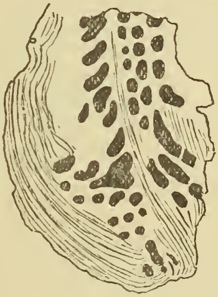

FIG. 15.—*Retecava clathrata* (Goldf.).

AFFINITIES.

This 'species' is the type of the genus. Fragments of the massive base are quite unlike ordinary Idmonids, and Pergens' suggestion that von Hagenow's *Neuropora cretacea* was founded on such a fragment is perhaps correct.

The *Idmonea verriculata* of von Hagenow is probably a synonym of this 'species,' as Hamm has previously suggested.

LIST OF SPECIMENS.

60,163. Two specimens, a fragment isolated (in tube) and one slide containing section. Maastrichter Kreide. Maastricht. Van Breda Coll. Section figured Fig. 15.

60,180. Two broken zoaria of var. *verriculata*. Maastrichter Kreide. Maastricht. Van Breda Coll.

60,178. A large zoarium (65 mm. by 45 mm.). Maastrichter Kreide. Maastricht. Van Breda Coll.

60,160. Numerous fragments. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3520. Thicker basal fragments (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3521. Base of a zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3597. Part of a worn zoarium (on slide), showing prominent zoarial lamina. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3222. Two fragments showing obverse face (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 1371. Two worn fragments showing obverse face (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 1372. One worn fragment showing obverse face (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3224. A series of zoaria and fragments. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3755. Fragment of zoarium showing reverse face (on slide). Maastrichter Kreide. Maastricht. Gamble Coll.

? **D. 3293.** A weathered zoarium, possibly a specimen of the *verriculata* form. Maastrichtian: Craie à baculites. Orglandes, Manche.

D. 6434, D. 6435, D. 6436. Eight specimens (on three slides). Maastrichter Kreide. St. Pierre. Busk Coll.

D. 6685, D. 6686. Six specimens (on two slides). Maastrichter Kreide. Fauquemont. Busk Coll.

2. **Retecava cretacea** (M. Edwards), 1838.

Synonymy.

Idmonea cretacea, M. Edwards, 1838. Mém. Cris.: Ann. Sci. nat. Zool. ser. 2, vol. ix. p. 237, pl. xii. fig. 5.

,, ,, Lonsdale, 1850. In Dixon, Geol. Suss. p. 275, pl. xviii. A, figs. 5, 5*a–h*.

,, ,, Morgan, 1882. Terr. crét. Scand.: Mém. Soc. géol. Fr. ser. 3, vol. ii. p. 15.

,, ,, Vine, 1884. Fourth Report: Rep. Brit. Assoc. 1883, p. 164.

,, *dixoniana*, Mantell, 1844. Med. Creat. vol. i. p. 287; p. 284, figs. 6, 12.

,, *communis*, d'Orbigny, 1853. Bry. Crét. p. 745, pl. 750, figs. 6–10.

,, ,, Pergens, 1890. Revision, p. 349.

,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. p. 134.

,, ,, Pergens, 1895. Bry. Cachemb.: Bull. Soc. belge Géol. vol. viii. p. 182.

,, *unipora* (*non* d'Orbigny), Beissel, 1865. Bry. Aach. Kr.: Nat. Verh. Holl. Maatsch. Wet. ser. 2, vol. xxii. p. 74, pl. viii. figs. 97–101.

Crisidmonea macropora, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 30, pl. ii. fig. 13.

DIAGNOSIS.

Zoarium of thick, frequently dichotomizing branches, rising from a thin, expanded base. The branches are all approximately in one plane. The branches are laterally compressed at the distal ends, and they are marked by a median keel or ridge; but in older parts of the branches the two rows of zoœcia are separated by a groove. Reverse surface well rounded, with small interzoœcial depressions.

Peristome of the innermost zoœcium of each series is well raised and prominent; and the distal ends of the branches, when viewed from the obverse side, may appear uniporous. Viewed laterally they are seen to be biserial or triserial, and in the proximal parts of the zoarium each series consists of four or five apertures.

The transverse series are vertical.

DISTRIBUTION.

ENGLAND:

Upper Chalk: Sussex; Portsmouth; Bromley; Northfleet.

FOREIGN:

Senonian—Maastrichtian: Meudon; St. Germain; Sainte-Colombe, Manche; Châteaudun, Eure-et-Loir; Ciply; Royan.
Campanian: Rügen; Quarnby, Sweden.
Santonian: Saintes, Perignac, Pons, etc., Charente-Inférieure; Arche de Lèves; Cachembach.
Coniacian: Vendôme, Les Roches, Villedieu, and Lisle, Loir-et-Cher; Tours, Indre-et-Loire.
Turonian: Merpins, Charente.

FIGURES.

Pl. IX. Fig. 8. Parts of three of the specimens figured by Lonsdale. Fig. 8*a*, obverse side of the end of a branch, showing the prominent median keel; × 8 dia. Fig. 8*b*, part of a lower branch, in which there is a median furrow instead of ridge; × 8 dia. Fig. 8*c*, part of a branch, from the side; × 8 dia. Upper Chalk: Sussex. Dixon Coll. **D. 2955.**

AFFINITIES.

On casual inspection of the specimens which Lonsdale figured as *I. cretacea*, they appear to differ from Milne Edwards' species. For in some of Lonsdale's fragments there is a definite raised median line along the obverse face of the branches, and the zoœcia appear to occur singly and alternately. Older fragments of the Sussex form have, however, no trace of a median line, and lateral examination of the branches shows that the apertures are triserial. As is so often the case with Dixon's Collection, the exact locality whence his specimens came is unknown.

LIST OF SPECIMENS.

British.

D. 2955. Nine fragments of a zoarium from the Chalk of Sussex, including those figured by Lonsdale: Dixon, Geol. Sussex, pl. xviii. A, figs. *5a*, *b*, *c*, *d*, *e*, *f*, and *g*. Dixon Coll. Three of the fragments are refigured as Pl. IX. Figs. 8*a*, *b*, and *c*.

D. 4491. Zoarium showing reverse face and isolated fragment of the same (in tube). The latter shows spine on reverse surface. Upper Chalk. Loc ? Dixon Coll.

D. 2838. Two fragments (on slide). Upper Chalk. Bromley. J. Simmons Coll.

D. 3110. A large zoarium with a fragment on slide, and a second fragment showing gonœcium. Fragment (on slide). Upper Chalk. Northfleet. Wetherell Coll.

D. 3127. Fragment with high peristomes (on slide). Upper Chalk. Kent. Simmons Coll.

Foreign.

D. 3749. Two fragments (on slide). Senonian. L'Arche de Lèves. Gamble Coll.

3. **Retecava ramosa** (d'Orbigny), 1850.

Synonymy.

Crisina ramosa, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 266.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 611, figs. 11–15.
Idmonea ,, d'Orbigny, 1853. Bry. Crét. p. 736.
,, ,, Pergens, 1890. Revision, pp. 312, 347.
Idmonea macilenta, von Hagenow, 1851. Bry. Maastr. Kr. p. 29, pl. ii. fig. 4.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
,, ,, Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.
,, *divaricata*, Ubaghs, 1865. Bry. Schicht. Maast.: Verh. naturh. Ver. Preuss. Rheinl. vol. xxii. p. 58, pl. iii. fig. 8.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 400.

Diagnosis.

Zoarium of laterally compressed dichotomous branches, which remain free laterally or unite to a network. The reverse side of the branches is occupied by a strong axis, which is broader than the obverse part of the zoarium. In the distal end the shape is biconvex. The reverse face is marked by interzoœcial depressions.

Zoœcia numerous, occurring in series of from six to fifteen. The apertures occur in long, horizontal, straight or curved rows, and are confined to the obverse lamina.

Peristomes slightly prominent.

DIMENSIONS.

	Fide Pergens.	B.M., D. 3549.
Breadth of a branch: lamina	—	1 mm.
Reverse axis	—	·5 ,,
Thickness of a branch	—	2 ,,
Diameter of zoœcia	·14–·18 mm.	·16 ,, (average)
Diameter of aperture	·09 ,,	·05–·1 ,, [1]
Distance of transverse series	·5–·6 ,,	·4–·5 ,,

DISTRIBUTION.

Senonian—Maastrichtian: Maastricht; Falkenberg; Kunraed; Sainte-Colombe, Manche; Royan.

Coniacian: Les Roches, Loir-et-Cher.

AFFINITIES.

That *C. ramosa*, Orb., and *I. macilenta*, Hag., are identical, there is little doubt; and as von Hagenow's diagnosis was published earlier than that of d'Orbigny the name of *macilenta* ought perhaps to stand. But as d'Orbigny's figure was probably issued earlier than von Hagenow's monograph, the name of *ramosa* is retained. M. Pergens has quoted the *Tubigera antiqua*, Orb., as a synonym; but the species seems to be a *Crisina* and a synonym of *C. disticha*, for d'Orbigny's figures give no suggestion whatever of a reverse axial rod.

LIST OF SPECIMENS.

D. 3549. One zoarium showing clasping base (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3548. One branch of a zoarium showing more distal portion than in the previous specimen. Maastrichter Kreide. Maastricht. Van Breda Coll.

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[1] In three adjacent curved rows, the inside measurements of the apertures in adjacent zoœcia are as follows:—

Row 1 : ·054, ·082, ·109 mm.
Row 2 : ·054, ·063, ·091 ,,
Row 3 : ·054, ·09 ,,

These measurements illustrate the variability of dimensions.

D. 1321. Four branches (on slide). Maastrichter Kreide. Falkenberg. Vine Coll.

D. 3357. A fragment of a zoarium showing obverse side (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3356. A branched fragment of a zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3033. A zoarium (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3518. Four zoaria (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3234. A thick base of a zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 7058. A longitudinal section cut from one of the specimens D. 3518. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3229, D. 3230. A zoarium and three fragments. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3237. A zoarium with a broad base. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6424. Twelve fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

4. **Retecava lichenoides** (Goldfuss), 1827.

SYNONYMY.

Retepora	*lichenoides*,	Goldfuss, 1827. Petref. Germ. vol. i. p. 29, pl. ix. fig. 13.
,,	,,	Morren, 1829. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 36.
,,	,,	Milne Edwards, 1836. In Lamarck, Hist. nat. Anim. sans Vert., 2nd ed., vol. ii. p. 283.
Reteporidea	,,	d'Orbigny, 1849. Gen. nouv. Bry.: Rev. Mag. Zool. ser. 2, vol. i. p. 500.
Idmonea	,,	von Hagenow, 1851. Bry. Maastr. Kr. p. 28, pl. ii. fig. 6.
,,	,,	Kade, 1852. Los. Verst. Schanzenb. p. 31.
,,	,,	Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 212.
non ,,	,,	Schreiber, 1884. Beitr. mittelolig. Gruns. Madgeb. p. 9, pl. ii. fig. 11.
Crisina	,,	d'Orbigny, 1854. Bry. Crét. p. 913.
,,	,,	Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.
,,	,,	Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
Crisidmonea	,,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 30.
Cœlophyma	*granulatum*,	von Hagenow, 1851. Bry. Maastr. Kr. p. 106, pl. ii. fig. 17.

DIAGNOSIS.

Zoarium rising from a discoid base; the branches grow as a reticular flabelliform expansion. The branches are laterally compressed, and consist of a thin or subtriangular lamina mounted on a thickened axis. The axis and reverse face are furrowed by irregular, linearly arranged, short depressions. The lamina has a strong central plate, which projects as a keel. Apertures in short, vertical series of from three to five, limited to the obverse lamina. The walls of the zoœcia below the aperture are usually depressed. Peristomes very slightly raised.

DIMENSIONS.

	B.M. D. 3546.	B.M. D. 3542.
Breadth of branch: lamina	1 mm.	·7 mm.
Reverse axis	2 ,,	1·0 ,,
Thickness of branch	2·5 ,,	1·5 ,,
Diameter of zoœcia	·18 ,,	·08–·1 ,,
Diameter of aperture	·11 ,,	·06–·08 ,,
Distance of transverse series	·5 ,,	·26 ,,

DISTRIBUTION.

Senonian—Maastrichtian: Maastricht, Falkenberg, and Petit-Lanaye,
Limburg; Kunraed.
Campanian: Rügen.

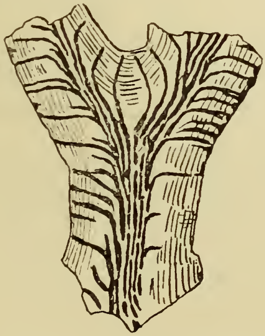

FIG. 16.—*Retecava lichenoides* (Goldf.).

FIGURE.

Fig. 16. Longitudinal section showing the zoœcia traversing the thick laminated epitheca, × 18 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 7509.**

AFFINITIES.

This species was chosen by d'Orbigny as the type of his genus *Reteporidea*. It differs from *Retecava ramosa* by the shortness of the series of peristomes, whereby it agrees with *R. carinata*, which is probably its nearest ally. In that 'species,' however, the peristomes open on a triangular ridge, which is smaller in proportion to the reverse axis than in *R. lichenoides*. The distal ends of the branches of the latter have a definite median zoarial or 'germinal' layer.

LIST OF SPECIMENS.

D. 3546. Fragment of zoarium near the base (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3543. Distal fragment (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3502. Worn base of a zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3542. Thin distal branch (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3220. Two zoaria, showing obverse and reverse aspects. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3540. A thin branched fragment, with thin, flat reverse axis. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3228. Two fragments (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3742. Two fragments (on slide). Maastrichter Kreide. Petit Lanaye. Gamble Coll.

D. 3221. Cup-shaped base of a massive zoarium; the branches are 4 mm. thick. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3235. Three broken zoaria (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 7059. A longitudinal section across a branch of D. 3235. Maastrichter Kreide. Maastricht. Van Breda Coll. Figd. No. 16, p. 195.

D. 3231. A nearly complete, much branched zoarium. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3225. Two worn basal parts of zoaria. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3226. A large series of zoaria. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3236. A worn, basal fragment of a large zoarium, without any trace of Idmoniiform apertures. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6426, D. 6427, D. 6428. Ten specimens (on three slides). Maastrichter Kreide. St. Pierre and Maastricht. Busk Coll.

5. **Retecava carinata** (Römer), 1840.

SYNONYMY.

Idmonea carinata, Römer, 1840. Verst. nordd. Kr. p. 21, pl. v. fig. 20.
non ,, ,, ? Manzoni, 1878. Brioz. Mioc. Austr.: Denk. Akad. Wiss. Wien. vol. xxxviii. pt. 2, p. 5.
non ,, ,, ? Seguenza, 1880. Formaz. Terz. Reggio: Atti Acc. Linc. ser. 3, Mem. vol. vi. p. 132.
,, ,, *pars*, Pergens, 1890. Revision, p. 348.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. p. 204.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii. p. 134.
,, *sulcata*, von Hagenow, 1851. Bry. Maastr. Kr. p. 32, pl. ii. fig. 12.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
,, *cytherea*, d'Orbigny, 1853. Bry. Crét. p. 746, pl. 750, figs. 11–15.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 400.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
,, *striolata*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 28, pl. ii. fig. 9.

DIAGNOSIS.

Zoarium of free dichotomous branches, which remain in approximately one plane. The branches consist of a large cylindrical reverse axis, longitudinally striated, and a triangular aperture bearing ridges on the obverse face. The proximal portions of the zoœcia forming the axis are very long and numerous.

Apertures in regularly alternate, crowded, vertical or oblique rows of from three to seven.

The series are very crowded, forming the obverse keel.

DISTRIBUTION.

BRITISH:

Upper Chalk: Magee Island, North Ireland.

FOREIGN:

Senonian—Maastrichtian: Maastricht; Fauquemont; Falkenberg; Bemelen.
Campanian: Rügen.
Santonian: L'Arche de Lèves, near Chartres, Indre-et-Loire.
Coniacian: Les Roches, Loir-et-Cher; Ste. Paterne.

FIGURE.

Fig. 17. Part of a branch from the side, × 20 dia. Upper Chalk: Magee Island. Presented by Jos. Wright, Esq. **D. 3273.**

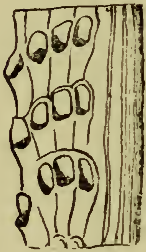

FIG. 17.—*Retecava carinata* (Röm.).

DIMENSIONS.

	Fide Pergens.	B.M., D. 3273.
Width of a branch	·5–3·0 mm. ...	·80 mm.
Thickness of the same ...	·5–3·0 ,, ...	·85 ,,
Diameter of zoœcia	·14–·18 ,, ...	·1–·15 ,,
Diameter of aperture ...	·06 ,, ...	·07–·1 ,,
Distance of transverse series of apertures	·4–·6 ,, ...	·4 ,,

AFFINITIES.

This 'species' appears to be most closely allied to *R. lichenoides*; the distinctions between them are stated on p. 196. *I. sulcata* shows the worn condition, but according to Hamm is a synonym of *R. pseudodisticha*.

LIST OF SPECIMENS.

BRITISH.

D. 3273. Fragment (on slide). Between Black Head and Gobbins, Magee Island. Presented by Jos. Wright, Esq. Fig. No. 17.

FOREIGN.

D. 1373. Three fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3758. Three fragments of form *sulcata* (on slide). Maastrichter Kreide. Mont St. Pierre, Maastricht. Gamble Coll.

D. 4667. Two fragments of form *sulcata* (on slide). Senonian—Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 3297. A well-preserved zoarium of form *sulcata*. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3239. Two broken zoaria of form *sulcata*. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3238. The basal portions of two zoaria. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3362. A thick, worn basal branch. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6298–6303. Six slides with series of specimens of the form *striolata*. Mucronatenkreide. Rügen. Laur Coll.

D. 6421, D. 6422. Twelve specimens of form *sulcata* (on two slides). Maastrichter Kreide. Maastricht. Busk Coll.

6. **Retecava pseudodisticha** (von Hagenow), 1851.

Synonymy.

Idmonea pseudodisticha, von Hagenow, 1851. Bry. Maastr. Kr. p. 31, pl. ii. fig. 9.
,, ,, d'Orbigny, 1853. Bry. Crét. p. 740, pl. 749, figs. 1–6.
,, ,, Brauns, 1875. Sen. Salzb.: Zeit. ges. Naturw. vol. xlvi. p. 401.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
,, ,, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. roy. mal. Belg. vol. xxi. p. 211.
non ,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 28, pl. ii. fig. 8.
,, ,, Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 204.
Retepora disticha, *pars*, Goldfuss, 1827. Petref. Germ. vol. i. p. 31, pl. ix. figs. 15*e*, *f* (*non a*, *b*).
Biretepora ,, d'Orbigny, 1849. Gen. nouv. Bry.: Rev. Mag. Zool. ser. 2, vol. i. p. 501.
Tubigera ,, *pars*, d'Orbigny, 1853. Bry. Crét. p. 723.
Idmonea lineata, von Hagenow, 1851. Bry. Maastr. Kr. p. 33, pl. ii. fig. 13.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
non ,, ,, Manzoni, 1877. Brioz. Mioc. Austr. iii.: Denk. Akad. Wiss. Wien. vol. xxxviii. pt. 2, p. 5, pl. iii. fig. 9.
non ,, ,, Seguenza, 1880. Formaz. terz. Reggio: Atti Acc. R. Linc. ser. 3, Mem. vol. vi. p. 209.
Idmonea maculata, *pars*, von Hagenow, 1851. Bry. Maastr. Kr. p. 27, pl. ii. figs. *a-d*, *non e-g*.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
,, ,, Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 213.
Retecava ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 32.
Idmonea carinata, *pars*, Pergens, 1890. Revision, p. 348.
,, *irregularis*, Beissel, 1865. Bry. Aach. Kr.: Nat. Verh. holl. maatsch. Wet. vol. xxii. p. 76, pl. viii. figs. 102–104.
,, *laticosta*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 28, pl. ii. fig. 1.

Idmonea commutata, Marsson, 1887. *Ibid.* p. 29, pl. ii. fig. 10.
,, *filiformis*, d'Orbigny, 1853. Bry. Crét. p. 744, pl. 750, figs. 1–5.
,, ,, Pergens, 1890. Revision, p. 346.
,, *carantina* (*non* Orb.), Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 308.

DIAGNOSIS.

Zoarium of stout or delicate branches, which are dichotomous. The reverse axis is rounded and longitudinally striated. The obverse face is also well rounded, so that the transverse section is elliptical.

Apertures in oblique series of from two to five, but usually three; the series are subalternate, and confined to the obverse face. The peristomes are well raised. The series are distant, sometimes very distant.

DIMENSIONS.

	Fide Pergens.
Diameter of branch	·5–3 mm.
Diameter of zoœcia	·14–·18 ,,
Diameter of apertures	·06 ,,
Distance of transverse series of apertures ...	·4–·6 ,,

DISTRIBUTION.

BRITISH:

Upper Chalk: Bromley; Magee Island, Antrim.
Middle Chalk: Chatham.

FOREIGN:

Danian: Faxoe.
Senonian—Maastrichtian: Maastricht; St. Pierre; Heer; Geulem; Ciply; Friedrichberg, near Aachen.
Campanian: Rügen.
Santonian: Salzberg, near Quedlinburg.

AFFINITIES.

Goldfuss included in his *Retepora disticha* a miscellaneous series of specimens which were first properly described by von Hagenow. That author refigured Goldfuss' type, and founded the 'species' '*pseudodisticha*,' which Pergens has proposed to merge in *R. carinata*. It is only with great hesitation that I venture not to follow in this course, for it is quite possible that the *carinata* form may be only the older basal portions of the *pseudodisticha*; but as the evidence for this seems still inconclusive, it is safer to retain the two forms distinct. In *Retecava carinata* there is a thick, triangular keel on the obverse side, formed by the closely packed peristomes; in *R. pseudodisticha*, on the contrary, the peristomes are well spaced and often well raised, and separated by a median groove. This character is best developed in the variety *filiformis*. The occurrence of fragments of both *R. carinata* and *R. pseudodisticha* at Magee Island is in favour of the identity of the two species.

A third variety of this 'species' may be represented by the Bryozoan described by Beissel as *Idmonea irregularis*, which has a double series of triserial apertures, separated by a well-marked anterior groove, and occurring on raised lateral crests. The upper part of Beissel's figure agrees fairly closely with *R. pseudodisticha*, but the lower part is thicker and irregular. Beissel suggested that the form might be only a variety of *R. pseudodisticha*.

LIST OF SPECIMENS.

British.

D. 446. Three fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 970. Two fragments (on slide). Middle Chalk. Chatham. Vine Coll., No. 26. Recorded by Vine as *Idmonea carantina*.

D. 972. Three fragments with especially distant peristomial series. Middle Chalk. Chatham. Vine Coll., No. 22.

D. 3272. Five fragments (two ? det.). Chalk. Between Black Head and Gobbins, Magee Island, N. Ireland. Presented by Jos. Wright, Esq.

D. 971. A slender branch (on slide). Middle Chalk. Chatham. Vine Coll., No. 27.

D. 456. Three fragments. Middle Chalk. Chatham. Gamble Coll.

D. 4501, D. 4502. Two branches (on slides). Middle Chalk. Chatham. Gamble Coll.

D. 530. Fragment of var. *filiformis* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3980. Four fragments of var. *filiformis* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4500. One fragment of var. *filiformis* (on slide). Upper Chalk. Bromley. Simmons Coll.

Foreign.

D. 3547. A fragment of a thicker zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3779. A worn fragment in the condition of *I. lineata*, Hag. Maastrichter Kreide. Geulem. Gamble Coll.

D. 3233. A zoarium of var. *maculata*. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6423. Four fragments (on slide). Maastrichter Kreide. Heer. Busk Coll.
D. 6425. Fifteen fragments (on slide). Maastrichter Kreide. St. Pierre. Busk Coll.

7. **Retecava cancellata** (Goldfuss), 1829.

SYNONYMY.

Retepora	*cancellata,*	Goldfuss, 1829. Petref. Germ. vol. i. p. 103, pl. xxxvi. fig. 17.
,,	,,	Morren, 1829. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 37.
,,	,,	M. Edwards, 1836. In Lamarck, Hist. nat. Anim. sans Vert., 2nd ed., vol. ii. p. 282.
,,	,,	von Hagenow, 1839. Mon. Rüg.: Neu. Jahrb. 1839, p. 281.
,,	,,	von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 590, pl. xxiii. *b*, fig. 2.
non Idmonea	,,	von Reuss, 1847. Foss. Polyp Wien.: Naturw. Abh. vol. ii. p. 46, pl. v. figs. 25–27; pl. vi. fig. 33.
Idmonea	,,	von Hagenow, 1851. Bry. Maastr. Kr. p. 29, pl. ii. fig. 7.
,,	,,	Kade, 1852. Los. Verst. Schanzenb. p. 31.
,,	,,	d'Orbigny, 1853. Bry. Crét. p. 739, pl. 748, figs. 20–23.
,,	,,	Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 213.
non ,,	,,	Manzoni, 1878. Brioz. Mioc. Austr.: Denk. Akad. Wiss. Wien. vol. xxxviii. pt. 2, p. 7, pl. v. fig. 18.
non ,,	,,	Seguenza, 1880. Formaz. terz. Regg.: Atti R. Acc. Linc. ser. 3, Mem. vol. vi. p. 85.
,,	,,	Hamm, 1881. Bry. mastr. Ob.-Sen. p. 32.
,,	,,	*pars*, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. mal. Belge, vol. xxi. p. 214.
,,	,,	*pars*, Pergens, 1890. Revision, p. 350.
Reteporidea	,,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 264.
Crisidmonea	,,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 30.
Idmonea	*hagenowi,*	Römer, 1840. Verst. nordd. Kr. p. 20.

DIAGNOSIS.

Zoarium of laterally compressed branches, which are laterally free or united into lattice-work by small dissepiments which bear no apertures. The zoœcia are loosely united, so that the surface appears porous. The reverse surface is marked by faint linear depressions. The reverse axis is but little broader than the obverse part of the branches.

Zoœcia in transverse rows of from three to five. The rows of apertures extend for half the thickness of the branches.

DIMENSIONS.

	Fide Pergens.
Diameter of branch	·3–·6 mm.
Diameter of zoœcia	·14 ,,
Diameter of aperture	·07 ,,
Distance of transverse series	·28–·34 ,,

DISTRIBUTION.

Danian : Faxoe.
Senonian—Maastrichtian : Maastricht ; Petit-Lanaye ; Fauquemont ; Royan.
Campanian : Rügen.

AFFINITIES.

This species is nearly allied to *Crisidmonea lichenoides*, but it differs from it mainly by the Fenestellid aspect of the zoarium, the branches being united by short dissepiments which do not bear apertures.

LIST OF SPECIMENS.

D. 3227. Two broken zoaria. Maastrichter Kreide. Maastricht. Van Breda Coll.
D. 6437. Seven fragments (on slide). Maastrichter Kreide. Fauquemont. Busk Coll.
D. 3576. Three broken zoaria. Maastrichter Kreide. Maastricht. Van Breda Coll.
D. 3575. A fragment of a zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

8. **Retecava geometrica** (von Hagenow), 1851.

SYNONYMY.

Idmonea geometrica, von Hagenow, 1851. Bry. Maastr. Kr. p. 32, pl. ii. fig. 11.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
Crisina ,, d'Orbigny, 1854. Bry. Crét. p. 913.

DIAGNOSIS.

Zoarium low and flat, with horizontal or slightly ascending branches. The branches consist of a rounded axis on the reverse side, and a narrower, triangular obverse portion, to which the apertures are restricted. The branches are usually free, but occasionally dissepiments may connect them.

Zoœcia opening in transverse vertical rows of from three to six. The peristomes are low.

Epitheca on reverse surface marked by strong punctures, irregularly arranged.

DISTRIBUTION.

Maastrichtian—Maastrichter Kreide: Maastricht; Geulheim.

FIGURE.

Fig. 18. Transverse section across a branch, × 20 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 4497.**

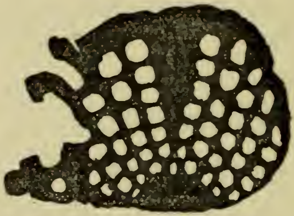

FIG. 18.—*Retecava geometrica* (Hag.).

AFFINITIES.

This Bryozoan is very nearly allied to *Crisidmonea lichenoides*, from which the principal difference is that the epitheca appears reticular instead of marked by linear depressions. Von Hagenow's figure suggests a striking difference in the apertures, which, however, is due probably to the peristomes having been worn down.

The reticular, coarsely porous nature of the epitheca in this form is of interest, as it marks an approach to the condition met with in *Hornera*.

That the 'canaux de renforcement' of Pergens are of little account in this genus is clear from the structure of *R. geometrica*, as shown by the figure of a transverse section. The dorsal axis is shown to consist of a series of fine tubes, which, however, are only the proximal ends of the zoœcia; the epitheca is seen as a thin basal lamina covering the reverse side. The section passes on the left side along the series of apertures, but this part of the section is incomplete and only one peristome is shown in the figure.

LIST OF SPECIMENS.

D. 4497. A zoarium showing transverse sections of distal ends of the branches. Maastrichter Kreide. Maastricht. Van Breda Coll. Fig. No. 18, p. 204.

D. 3232. Two well-preserved zoaria, one of which is umbrella-shaped, the radial branches being raised on a cylindrical stem 2·5 mm. in height. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3286. Seven zoaria (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3285. Six zoaria (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3519. The central portion of a zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3551. Two zoaria (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3577. A zoarium (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6430. Eight fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **abbotti** (Gabb & Horn), 1860.

SYN. *Heterocrisina abbotti*, Gabb & Horn, 1860. Journ. Acad. Nat. Sci. Phil. ser. 2, vol. iv. p. 404, pl. lxix. figs. 45–7.
Bicrisina ,, Gabb & Horn, 1862. Foss. Polyz. N. Amer.: *ibid.* ser. 2, vol. v. p. 174, pl. xxi. fig. 65.

CHAR.—Zoarium of subquadrate branches, with the apertures in lateral transverse rows of four in each. Reverse side large and convex. Innermost apertures much larger than the rest.

AFF.—Nearly allied to *Retecava cretacea* (Edw.), but distinguished by the greater difference in size between the innermost and remaining apertures.

2. **areolata,** Marsson, 1887.

SYN. *Retecava areolata*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 36, pl. iii. fig. 9.

CHAR.—Zoarium of thick branches with a strong median lamella, and the lateral series of apertures at right angles to the median series, and not passing off in oblique, curved series. The series are somewhat irregular. The lateral series include from four to six apertures.

DISTRIB.—Senonian: Rügen.

Aff.—This differs from *R. clathrata* by its straight, lateral series of apertures.

3. **carantina** (d'Orbigny), 1853.

Syn. *Idmonea carantina*, d'Orbigny, 1853. Bry. Crét. p. 734, pl. 748, figs. 1-5.
,, ,, Pergens, 1890. Revision, p. 346.

Char.—Apparently allied to *R. subgradata*, but with narrower median groove.

Distrib.—Turonian: Angoulême.

4. **cypris** (d'Orbigny), 1853.

Syn. *Idmonea cypris*, d'Orbigny, 1853. Bry. Crét. p. 741, pl. 749, figs. 7-10.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 31.
,, ,, Pergens, 1890. Revision, p. 349.

Char.—Branches cylindrical. Apertures in curved rows of from four to five, crowded. Reverse face convex.

Distrib.—Senonian—Maastrichtian: Meudon; Ciply.
Coniacian: Vendôme.

5. **dichotoma** (Gabb & Horn), 1862.

Syn. *Idmonea dichotoma*, Gabb & Horn, 1862. Mon. foss. Polyz. N. Amer.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 173, pl. xxi. fig. 64.

Char.—Allied to *R. clathrata* by its prominent median lamina, it differs by having more crowded median apertures, and in the lateral series being less regular.

Distrib.—Turonian: Timber Creek, New Jersey, U.S.A.

6. **gibbosa** (von Hagenow), 1851.

Syn. *Idmonea gibbosa*, von Hagenow, 1851. Bry. Maastr. Kr. p. 33, pl. ii. fig. 14.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 400.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 32.

Char.—Allied to *Retecava ramosa* (Orb.), but with a series of blunt, broad projections on the reverse side of the zoarium.

Distrib.—Senonian: Maastricht.

7. **grandis** (d'Orbigny), 1853.

Syn. *Idmonea grandis*, d'Orbigny, 1853. Bry. Crét. p. 743, pl. 749, figs. 16-19.
,, ,, Pergens, 1890. Revision, p. 346.

Char.—Branches elliptical in section. Apertures in rows of about six. The opposite series are separated by a wide median groove.

Distrib.—Senonian—Santonian: Saintes and Pons, Charente-Inférieure.

8. **insignis** (Marsson), 1887.

Syn. *Idmonea insignis*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 29, pl. ii. fig. 12.

Char.—Zoarium of cylindrical branches with subalternate rows of five or six apertures, one series of which extends to the middle line. Reverse with large irregular pores.

Distrib.—Senonian: Rügen.

Aff.—Possibly a basal part of *R. pseudodisticha* (Hag.).

9. ? **sagena** (Gabb & Horn), 1860.

Syn. *Reticulipora sagena*, Gabb & Horn, 1860. New Cor. N.J.: Proc. Acad. Nat. Sci. Phil. 1860, p. 366.
,, ,, Gabb & Horn, 1860. New Amer. Foss.: Journ. *ibid.* ser. 2, vol. iv. p. 400, pl. lxix. figs. 30–2.
,, ,, Gabb & Horn, 1862. Foss. Polyz. N. Amer.: *ibid.* ser. 2, vol. v. p. 173.

Char.—Zoarium Reticrisian in form, but the description and figures of the zoœcia rather suggest a Retecavan affinity.

Distrib.—Turonian: Timber Creek, New Jersey.

10. ? **subgradata** (d'Orbigny), 1850.

Syn. *Crisina subgradata*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 266.
,, ,, d'Orbigny, 1851–4. Bry. Crét. p. 914, pl. 612, figs. 6–10.
,, ,, Pergens, 1890. Revision, p. 357.

Char.—Apertures in triserial rows, which are alternate and widely separated by a median groove. Obverse surface rounded.

Distrib.—Senonian—Maastrichtian: Fécamp.

Aff.—Pergens remarks that the specimen is unlike the figure. D'Orbigny's description suggests close affinity to *R. cretacea* (Edw.).

BITUBIGERA, d'Orbigny, 1853.

Synonyms.

Bitubigera, d'Orbigny, 1853.
Idmonea, *pars*, Philippi, 1844.
Idmonea, *pars*, d'Orbigny, 1852.
Bitubigera, Marsson, 1887.

Diagnosis.

In all respects like *Crisina*, except that the lateral rows of apertures are biserial instead of uniserial.

TYPE SPECIES.

Idmonea biseriata, Philippi, 1844. Tert. Verst. nordw. Deutsch. p. 67, pl. i. fig. 15. Oligocene: Germany.

compressa, Marsson, 1887.

SYN. *Bitubigera compressa*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 31, pl. iii. fig. 1.

CHAR.—Branches high and narrow, being very compressed laterally. Rows of apertures curved, about eleven apertures in each line.

DISTRIB.—Senonian—Campanian: Rügen.

REPTOFASCIGERA, d'Orbigny, 1853.

[Bry. Crét. p. 685.]

DIAGNOSIS.

Idmoniidæ with an adnate zoarium, and the apertures in well-raised, alternate, widely separated biserial rows.

TYPE SPECIES.

Reptofascigera alternata, d'Orbigny, 1853: Bry. Crét. p. 686, pl. 744, figs. 4–6. Pergens, 1890: Revision, p. 377. Santonian: Saintes, Charente-Inférieure.

AFFINITIES.

This genus may be regarded as an adnate *Bitubigera*. It is not represented in the collection.

PERGENSELLA, nov.

SYNONYMS.

Retepora, pars, Goldfuss, 1827.
Idmonea, pars, von Hagenow, 1851.

DIAGNOSIS.

Idmoniidæ with erect zoarium, attached by a disc-shaped base. Branches simple and subcylindrical, with a keel along the obverse side.

Zoœcia opening in two series, median and lateral. The apertures of the median series occur in crowded alternate rows along each side of the median ridge. From the median series there are offshoots forming ridges down the sides of the branches; the lateral series are alternate, and the apertures are biserial or multiserial.

TYPE SPECIES.

Idmonea geniculata, von Hagenow. Maastrichter Kreide: Maastricht.

AFFINITIES.

The interesting Bryozoan on which this genus is founded occurs in the Maastricht Chalk, and has been previously assigned to *Idmonea.* It differs from other Idmonids by having lateral alternate series of apertures continued round on to the reverse side, as well as a median series. Fig. 19 shows the relation between the two series. But for the lateral series this Bryozoan would be a near ally of *Retecava carinata* (Röm.). The genus resembles *Bitubigera* in the fact that the apertures of the lateral series are not uniserial, but it differs from that genus by the possession of a prominent median series and by having more than two rows of apertures in the lateral series.

As it was my ill fate to have to propose the abandonment of the genus *Pergensia*, I take this opportunity of reintroducing M. Pergens' name into the nomenclature of Bryozoa. His name could not be associated with a more appropriate species than *P. geniculata*, as it is one of the most remarkable members of the fauna near M. Pergens' home.

Pergensella geniculata (von Hagenow), 1851.

SYNONYMY.

Retepora clathrata, pars, Goldfuss, 1827. Petref. Germ. vol. i. p. 29, pl. ix. figs. 12*e*, *f*.
Idmonea geniculata, von Hagenow, 1851. Bry. Maastr. Kr. p. 33, pl. iii. fig. 5.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
,, ,, Winkler, 1864. Musée Teyl.: Cat. Pal. livr. ii. p. 213.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 32.

DIAGNOSIS.

Zoarium with narrow reverse face notched by the extension on to it of the lateral ridges.

Apertures in the median series in rows of from three to four; the rows are crowded. Apertures in the lateral series in rows of from three to eight; the apertures are small and closely packed.

DISTRIBUTION.

Senonian — Maastrichtian: Maastricht and Bemelen, in Maastrichter Kreide.

FIGURES.

Fig. 19. Part of the obverse face of a zoarium, showing the junction of the lateral and median series of apertures; × 10 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 3379.**

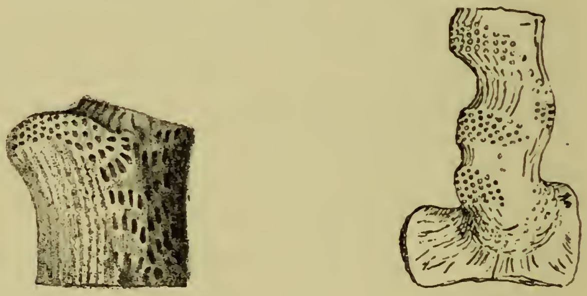

FIG. 19. FIG. 20.

Pergensella geniculata (Hag.).

Fig. 20. Base and lower part of a zoarium, × 7 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 3380.**

LIST OF SPECIMENS.

D. 3379.	Three branches (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll. One specimen figured as Fig. 19.
D. 3380.	One specimen with base (on slide). Maastrichter Kreide. Maastricht. Figured as Fig. 20.
D. 3378.	Eight branches. Maastrichter Kreide. Maastricht. Van Breda Coll.
D. 3523.	Three branches. Maastrichter Kreide. Maastricht. Van Breda Coll.
D. 6431.	Six branches (on slide). Maastrichter Kreide. Bemelen. Busk Coll.
D. 1375.	A branch (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

SULCOCAVA, d'Orbigny, 1854.

SYNONYM.

Laterocava, d'Orbigny, 1854.

DIAGNOSIS.

Idmoniidæ with erect branched zoarium. Branches laterally compressed. Zoœcia opening in alternate transverse rows on the sides of the branches. The rows are uniserial.

There is a considerable development of lamellar epitheca; tear-shaped depressions in the epitheca are often present, and look like secondary apertures.

TYPE SPECIES.

Sulcocava cristata, d'Orbigny, 1853–4. Senonian: France.

AFFINITIES.

This genus has been very differently interpreted, owing to the depressions below the apertures. D'Orbigny placed the genus in the Cavidæ; Marsson included it in the Entalophoridæ, in which it was doubtfully retained by Pergens. The best figures of the structure of the genus we owe to Marsson, who shows that the zoarium consists of a central axis of zoœcia, covered by a laminar epitheca, which is traversed by alternate rows of apertures.

Sulcocava appears therefore to be one of the specialized Cretaceous forms of Idmonids. It agrees with that family in the characters of the zoœcia, the lateral compression of the branches, the bare reverse face, and the occurrence of the apertures in alternate transverse rows. The genus may, in fact, be regarded as a *Reticrisina*, with a laminated epitheca, in which there may be a series of depressions simulating secondary apertures.

1. Sulcocava cristata, d'Orbigny, 1853–4.

SYNONYMY.

Sulcocava cristata, d'Orbigny, 1853–4. Bry. Crét. p. 1021, pl. 789, figs. 4–8.
,, ,, Pergens, 1890. Revision, p. 368.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 207.

Sulcocava lacryma, d'Orbigny, 1853–4. Bry. Crét. p. 1022, pl. 789, figs. 9–12.
,, ,, Pergens, 1890. Revision, p. 368.
,, *sulcata*, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 310.

DIAGNOSIS.

Zoarium of laterally compressed branches, which divide dichotomously. The obverse face is carinate.

Zoœcia a central unpaired series along the obverse face; laterally there are alternate rows of from three to six apertures. The front walls of the zoœcia are depressed. The zoœcia are separated by longitudinal furrows.

Apertures elliptical, crowded, in regular alternate rows.

DIMENSIONS.

Diameter of branch	·3 × ·5 mm.
Diameter of zoœcia	·12 ,,
Diameter of aperture	·08–·1 ,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:
Senonian—Maastrichtian: Royan, Charente-Inférieure.
Coniacian: Vendôme and Varennes, Loir-et-Cher; Tours, Joué, Luynes, and La Ribochère, Indre-et-Loire.

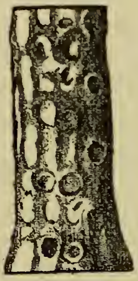

FIG. 21.

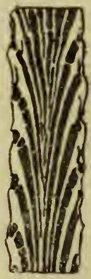

FIG. 22.

Sulcocava cristata, Orb.

FIGURES.

Fig. 21. Part of a branch, × 26 dia., from the side. Middle Chalk: Chatham. Vine Coll. **D. 714.**

Fig. 22. Longitudinal section of another branch, showing tabulæ; × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3974.**

AFFINITIES.

This species may be conveniently taken as the type of the genus, although *S. sulcata* was the first in order of d'Orbigny's three species; but that form was not so well figured, and the fragment may have been much worn.

D'Orbigny's figures do not appear very satisfactory, so that the specific determination of the English specimens is open to doubt.

LIST OF SPECIMENS.

D. 714. A branched fragment (on slide). Middle Chalk. Chatham. Vine Coll., No. 481G. Recorded as *Sulcocava sulcata?* Vine: Rep. Brit. Assoc. 1892, p. 310. Figd. No. 21.

D. 3971. Two fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3974. Three fragments (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. No. 22.

D. 2705. One fragment (on slide). Middle Chalk. Chatham. Vine Coll.

?**D. 411.** A worn fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4487. A free branched fragment. Middle Chalk. Chatham. Vine Coll.

2. **Sulcocava gracilis** (d'Orbigny), 1853–4.

SYNONYMY.

Laterocava gracilis, d'Orbigny, 1853–4. Bry. Crét. p. 1023, pl. 789, figs. 17–20.
,, ,, Pergens, 1890. Revision, p. 368.

DIAGNOSIS.

Zoarium of subcylindrical or slightly compressed branches, which are divided dichotomously; apertures circular, small, surrounded by a low, bead-like peristome. The apertures are in regular transverse series, without any unpaired median row.

DIMENSIONS.

Diameter of branch	1 mm.
Diameter of zoœcia	·25 ,,
Diameter of aperture	·1–·15 ,,

DISTRIBUTION.

ENGLAND:
Middle Chalk: Chatham.

FOREIGN:
Senonian: Meudon, near Paris.

FIGURE.

Fig. 23. Side of a branch showing transition from zoœcia with suboral depressions to zoœcia with only a slight widening of the suture; × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3972.**

AFFINITIES.

This 'species' may be, as Pergens has suggested, only a form of *S. cristata*; but the series of specimens in the Museum collection does not give much support to that idea, and certainly does not prove it. The main differences between the two 'species' are that in *S. gracilis* the stems are less compressed, the apertures are smaller and round, and occur in more regular transverse rows.

The specimen represented by Fig. 23 suggests that the depression in the front wall of typical zoœcia of *Sulcocava* are due to enlargements of the interzoœcial suture. In the lower part of the specimen the depressions are represented only by widening of the suture; in the upper part the depressions are immediately below the aperture and appear as if in the front wall of the zoœcia, but this is probably due to the backward course of the zoœcia, the peristomes being obversely bent at their distal ends.

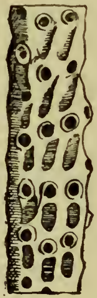

FIG. 23.—*Sulcocava gracilis* (Orb.).

The figure in d'Orbigny is probably imperfect, his specimen having been much worn, so that the determination of the British specimens is somewhat doubtful.

LIST OF SPECIMENS.

D. 3972. Two fragments (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. No. 23.

D. 3970. Three fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 428. One young and one old fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

3. Sulcocava costulata, Marsson, 1887.

SYNONYMY.

Sulcocava costulata, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 24, pl. ii. fig. 1.

DIAGNOSIS.

Zoarium of stout branches, which are elliptical in transverse section.

Apertures in regular, horizontal, alternate rows on either side of a double, unpaired, median row along the middle of the obverse face. The bare reverse face is narrow. A large depression below the aperture in each zoœcium.

DISTRIBUTION.

Senonian—Campanian: Rügen.

LIST OF SPECIMENS.

D. 6296. Two branches (on slide). Mucronatenkreide. Rügen. Laur Coll.

D. 6297. A single worn branch (on slide). Mucronatenkreide. Rügen. Laur Coll.

D. 6295. A branch somewhat twisted. Mucronatenkreide. Rügen. Laur Coll.

D. 6311–3. Three specimens (on slides). Mucronatenkreide. Rügen. Laur Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. rustica (d'Orbigny), 1853.

SYN. *Laterocava rustica*, d'Orbigny, 1853–4. Bry. Crét. p. 1023, pl. 789, figs. 13–16.
,, ,, Pergens, 1890. Revision, p. 368.

CHAR.—Apertures small and very crowded. On the broad flat side of the zoarium they are irregularly quincuncial, but on the obverse side they appear in alternate horizontal series.

DISTRIB.—Senonian: Ste. Colombe, Manche.

2. sulcata, d'Orbigny, 1853–4.

SYN. *Sulcocava sulcata*, d'Orbigny, 1853–4. Bry. Crét. p. 1020, pl. 789, figs. 1–3.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 23.
,, ,, Pergens, 1890. Revision, p. 368.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 207.
,, ,, Pergens, 1895. Bry. Cachemb.: *ibid.* vol. viii. p. 182.

Char.—Apertures occurring between strong vertical ribs. Pergens suggests that it may be a form of *S. cristata*.

Distrib.—Senonian—Maastrichtian: Meudon, near Paris.
Campanian: Rügen.
Coniacian: St. Paterne and La Ribochère, Indre-et-Loire; Cachembach, near Chartres, Eure-et-Loir.

Family ENTALOPHORIDÆ.

Diagnosis.

Cyclostomata Tubulata in which the zoarium is erect and dendroid; the branches consist of solid bunches of zoœcia, which open all round the stem. There are no dactylethræ, cancelli, mesopores, or appendages. The marsupial chambers may be gonœcia or gonocysts.

Affinities.

This family differs from the Idmoniidæ by the fact that the zoœcia open on all sides of the branches; it differs from the Eleidæ owing to the presence of avicularia and the lateral or subterminal position of the apertures in that family. The basal areas, by which the zoarium is attached, are berenicoid or proboscinoid.

ENTALOPHORA, Lamouroux, 1821.

Synonyms.

Ceriopora, *pars*, Goldfuss, 1827.
Pustulopora (*non* de Blainville), M. Edwards, 1838; von Hagenow, 1851; Busk, 1886.
Clavisparsa, d'Orbigny, 1853.
Bidiastopora, *pars*, d'Orbigny, 1853.
Filisparsa, *pars*, d'Orbigny, 1854.
Cisternifera, *pars*, Walford, 1894.
Pergensia, Walford, 1894.

Diagnosis.

Entalophoridæ in which the zoarium consists of thin stems, usually formed of a small number of zoœcia. The base is encrusting.

Zoœcia cylindrical, tapering below. The aperture is terminal, and equal in size to the diameter of the zoœcia; the apertures are scattered irregularly.

Gonœcia usually present.

TYPE SPECIES.

Entalophora cellarioides, Lamouroux, 1821. Expos. Méth. p. 81, pl. lxxx. figs. 9–11. Bathonian: France. For synonymy and figures see Cat. Jur. Bry. pp. 139, 140, pl. viii. fig. 1.

CRETACEOUS REPRESENTATIVES.

The group of Bryozoa represented in the Jurassic rocks by *Entalophora cellarioides*, Lamx., and in existing seas by *Entalophora proboscidea* (Edw.), was represented in the Cretaceous period by several allied 'species,' of which *E. virgula* (Hag.) is the most typical. Pergens has identified one of the Cretaceous with the living species, and therefore accepted for it the name of *proboscidea*. But the Jurassic *E. cellarioides* appears to me as intimately related to the Cretaceous *E. virgula* as that form is to the living *E. proboscidea*. If, therefore, the two latter are to be united, the *E. cellarioides* ought to be included with it, and the name *E. proboscidea* dropped as a synonym.

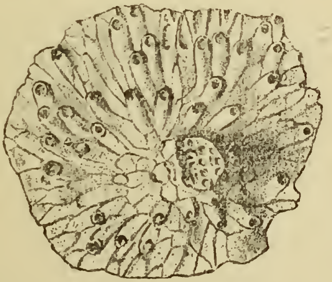

FIG. 24.—*Entalophora*, sp. Base of a zoarium, × 10 dia. Upper Chalk: Charing. T. R. Jones Coll. D. 2863.

The relations of the Entalophoridæ to the Diastoporidæ are illustrated by Fig. 24, which represents the discoid, encrusting base of an Entalophorid. Had the central part been broken away the specimen would have been indistinguishable from a *Berenicea*. But the erect, solid axis, which is shown, broken across transversely, near the centre of the figure, proves that the specimen is the base of an Entalophorid. Similar specimens showing a greater length of the central axis are illustrated on Pl. XI. Figs. 1–3. The close agreement between the Entalophoridæ and Diastoporidæ is further shown by the relations of some species of *Entalophora* and *Diastopora*. In some *Entalophoræ* the axis becomes locally hollow (see *e.g.* Pl. XI. Fig. 3 and Fig. 8); such specimens approximate the condition of those *Diastoporæ* in which the zoarium is coiled into a tube of small diameter. Such *Diastoporæ* differ from *Entalophora* only in that the zoarium is unilaminar. Zoœcially there seems to be no difference between them.

1. **Entalophora virgula** (von Hagenow), 1840.

SYNONYMY.

Ceriopora virgula, von Hagenow, 1840. Mon. Rüg.: Neu. Jahrb. 1840, p. 646.
Pustulipora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 17, pl. i. fig. 3.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.
,, ,, Schlüter, 1870. Reise südl. Schwed.: Neu. Jahrb. 1870, p. 939.
Entalophora ,, von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 116, pl. xxix. figs. 1, 2.
,, ,, von Reuss, 1874. Bry. ob. Plan.: *ibid.* vol. xx. pt. 2, p. 133.
,, ,, Marsson, 1888. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, p. 20.
,, *raripora*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 621, figs. 1–3.
,, ,, d'Orbigny, 1853. *Ibid.* p. 787.
,, ,, Beissel, 1865. Bry. Aach. Kr.: Nat. Verh. holl. maatsch. Wet. ser. 2, vol. xxii. p. 82, pl. x. figs. 120–128.
,, ,, Novak, 1877. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 108, pl. viii. figs. 1–5; pl. x. figs. 1, 2.
,, ,, *pars*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 28.
,, ,, Fric, 1883. Isersch.: Arch. naturw. Landesf. Böhm. vol. v. No. 2, p. 125, fig. 107.
,, ,, *pars*, Waters, 1884. Foss. Cycl. Austr.: Quart. Journ. Geol. Soc. vol. xl. p. 686.
,, ,, *pars*, Vine, 1885. Notes Cambr. Gr.: Proc. Yorks. Geol. Soc., new ser., vol. ix. p. 14, pl. i. figs. 1, 2.
Pustulipora rustica, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 17, pl. i. fig. 5.
,, ,, Winkler, 1864. Musée Teyl.: Cat. Pal. livr. ii. p. 213.
Bidiastopora ,, (*non* Hag.), d'Orbigny, 1851 & 1853. Bry. Crét. p. 804, pl. 628, figs. 1–4.
,, *nana*, von Hagenow, 1851. Bry. Maastr. Kr. p. 17, pl. i. fig. 4.

Entalophora	*santonensis*,	d'Orbigny, 1850. Bry. Crét. pl. 623, figs. 15–17.
,,	*icaunensis*,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 87.
,,	*iconensis*,	d'Orbigny, 1851. Bry. Crét. pl. 616, figs. 12–14.
,,	*icaunensis*,	d'Orbigny, 1853. *Ibid.* p. 781.
,,	*variegata*,	d'Orbigny, 1851–3. *Ibid.* p. 792, pl. 622, figs. 18–21.
,,	*subgracilis*,	d'Orbigny, 1851 & 1853. *Ibid.* p. 788, pl. 621, figs. 4–6.
,,	*alternata*,	d'Orbigny, 1851. *Ibid.* pl. 621, fig. 7.
Filisparsa	,,	d'Orbigny, 1854. *Ibid.* p. 819.
Idmonea	,,	Pergens, 1890. Revision, p. 343.
,,	*subalternata*,	d'Orbigny, 1854. Bry. Crét. p. 746.
Entalophora	*incerta*,	Vine, 1884. Fourth Rep.: Rep. Brit. Assoc. 1883, p. 167.
,,	*proboscidea*	(*non* Edw.), Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. roy. mal. Belg. vol. xxi. p. 202.
,,	,,	(*non* Edw.), Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 205.
,,	,,	var. *elegans*, Vine, 1889. Polyz. Greens.: Proc. Yorks. Geol. Soc. vol. xi. p. 260.
,,	,,	Bucaille, 1890. Bry. Crét. Seine-Infér.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
? ,,	sp.,	Vine, 1890. Bry. Red Chalk: Quart. Journ. Geol. Soc. vol. xlvi. p. 479.
? ,,	*proboscidea*,	Vine, 1891. Polyz. Red Chalk: Proc. Yorks. Geol. Soc. vol. xi. p. 381.
,,	,,	Vine, 1891. Cret. Polyz.: Rep. Brit. Assoc. 1890, p. 392.
,,	,,	var. *elegans*, Vine, 1891. *Ibid.* p. 392.
,,	,,	var. *delicatula*, Vine, 1891. *Ibid.* p. 392.
,,	,,	Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 22, pl. ii. figs. 23, 24.
,,	,,	Stolley, 1892. Kr. Schl. Holst.: Mitt. min. Inst. Kiel. vol. i. p. 245.
,,	,,	Pergens, 1892. Nouv. Cycl. Cret.: Bull. Soc. belge Géol. vol. iv., Mém. p. 278, pl. xi. fig. 6.
,,	,,	*typica*, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, pp. 309, 330.
,,	,,	? *forma raripora*, Vine, 1893. *Ibid.* p. 309.
,,	,,	? *forma iconensis*, Vine, 1893. *Ibid.* p. 309.
,,	,,	? *forma filiformis*, Vine, 1893. *Ibid.* p. 309.
,,	,,	? *forma linearis*, Vine, 1893. *Ibid.* p. 309.
,,	,,	? *forma rustica*, Vine, 1893. *Ibid.* p. 309.
,,	,,	Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 206.
,,	,,	var. *rustica*, Pergens, 1893. *Ibid.* p. 206.
,,	,,	Pergens, 1895. Bry. Arche de Lèves: *ibid.* vol. viii. p. 135.
,,	,,	var. *rustica*, Pergens, 1895. *Ibid.* p. 136.
,,	,,	Pergens, 1895. Bry. Cachemb.: *ibid.* vol. viii. p. 182.

Entalophora proboscidea, var. *rustica*, Pergens, 1895. Bry. Cachemb.: Bull. Soc. belge Géol. vol. viii. p. 182.
,, ,, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 153.
,, ,, Canu, 1897. Bry. St. Cal.: *ibid.* p. 745.
,, *madreporacea*, *pars*, Bucaille, 1890. *Op. cit.* p. 507.

DIAGNOSIS.

Zoarium tufted of fine cylindrical shoots. The branches are very thin at the distal ends (var. *subgracilis*, Orb.), thicker near the base (form *rustica*, Hag.), where they may be somewhat broadened and compressed (form *rustica*, Orb.).

Zoœcia few in number; the apertures are very distant and irregularly distributed. The walls may be smooth or transversely wrinkled in the thicker forms.

Peristomes well raised and reflexed distally; worn flush with the surface in the proximal parts.

Gonœcium small; piriform or subconical.

DIMENSIONS.

	Fide Pergens.	*Fide* Waters.	B.M. D. 461.	B.M. D. 4516.	B.M. D. 376. *subgracilis*.
Diameter of branch	—	—	·6 mm.	1 mm.	·3 mm.
Diameter of zoœcia	·26–·32 mm.	—	·3 ,,	·3–·5 ,,	·2 ,,
Diameter of aperture	·10–·12 ,,	·16 mm.	·2 ,,	·2–·25 ,,	·12 ,,

DISTRIBUTION.

BRITISH:

Upper Chalk: Gravesend; Bromley; Kent; Magee Island, Antrim; Slieve Gallion and White Abbey, Derry.
Middle Chalk: Chatham.
Chalk Detritus: Charing.
Upper Greensand: Cambridge.

FOREIGN:

Danian: Faxoe.
Senonian—Maastrichtian: Maastricht; Falkenberg; Fauquemont; Ciply; Ste. Colombe, Manche, in Craie à baculites; Fécamp, Seine-Inférieure; Meudon; Chapet, Seine-et-Oise; Royan.
Campanian: Lägerdorf, in Quadratenkreide; Rügen; S. Sweden.
Santonian: Arche de Lèves and Cachembach, near Chartres; Saintes, Pons, Perignac, etc., Charente-Inférieure.

Coniacian: Tours, Joué, Luynes, Sainte Paterne, and La Ribochère, Indre-et-Loire; Vendôme, Lavardin, Lisle, Villedieu, Les Roches, etc., Loir-et-Cher.
Turonian—Angoumian: Merpins, Charente; St. Germain d'Arcé, Sarthe; Villavard; Strehlen, in Upper Pläner; Gross-Ujezd, Vtelno, and Chorouschek, near Mscheno, Bohemia, in Iserschichten; Les Roches, Montoire, Villardin, and St. Rimay, Loir-et-Cher.
Cenomanian: Saint Calais, Janières, Sarthe; Plauen, Saxony, in Lower Pläner; Kank and Jiné, in Korycaner Schichten.
Neocomian: Ste. Croix and Pontarlier (*fide* Waters).

FIGURES.

Pl. X. Fig. 1. A zoarium of var. *raripora* (Orb.); × 6 dia. Middle Chalk: Chatham. Gamble Coll. **D. 461.**

Pl. X. Fig. 2. A part of a larger zoarium of the typical variety; × 6 dia. Middle Chalk: Chatham. Presented by Wm. Gamble, Esq., 1889. **D. 4516.**

Pl. X. Fig. 3. Part of a zoarium of var. *alternata*, Orb.; × 6 dia. Upper Chalk: Bromley. Simmons Coll. **D. 2835.**

Pl. X. Fig. 4. Fragment of a zoarium of var. *subgracilis*, Orb.; × 6 dia. Middle Chalk: Chatham. Gamble Coll. **D. 376.**

Pl. XI. Fig. 16. A worn fragment. Upper Chalk: Gravesend. Vine Coll. **D. 1001.**

Pl. XI. Fig. 18. Part of a specimen which is one of the types of *Entalophora proboscidea, elegans*, Vine. Upper Greensand: Cambridge. Jesson Coll. *Ex* **B. 4447.**

AFFINITIES.

This Bryozoan belongs to the same group of *Entalophoræ* as the type species of the genus and the living *E. proboscidea* (Edw.). It differs from the former by its more fragile growth and the shorter free distal ends of the zoœcia. Its distinction from *E. proboscidea* is more difficult of definition, though it is easy to separate the specimens. In the living 'species' the zoœcia are more numerous in the proximal parts of the zoarium, and the free portions of the zoœcia are longer, whereas in the Cretaceous form the basal zoœcia have very low peristomes.

M. Pergens, the great advocate of the specific value of the dimensions of zoœcia, states that the diameters of the zoœcia and aperture in Cretaceous specimens are ·10 to ·12 mm. and ·26 to ·32 mm. respectively. In a recent specimen from Naples, in the

Museum collection (D. 941), which M. Pergens has identified as *E. proboscidea*, the diameters of the zoœcia and apertures are respectively ·16 mm. and ·21 mm.; these proportions agree more nearly with M. Pergens' figures for *E. ramosissima* (·16 mm. and ·26 mm. respectively) than with those he gives for *E. proboscidea.*

The Neocomian specimen figured by d'Orbigny as *E. iconensis* (Bry. Crét. pl. 616, figs. 12–14) appears from the figure to have finer zoœcia than *E. virgula*; but as d'Orbigny states that the branches are ·5 mm. in diameter, his figure is magnified 10 dia., and the apertures are about ·1 mm. in dia., and the length of the exposed portions of the zoœcia from 1 to 1·5 mm. They are thus shorter than in *E. pergensi*, which resembles *E. iconensis* in appearance; the latter may be regarded as the Neocomian representative of the form *subgracilis.*

E. carantina, Orb., is regarded as a synonym by von Reuss (1874); but the grouping of the apertures into irregular nodes makes *E. carantina* a nearer ally of *E. geminata*, or possibly even of *Peripora.* The *Pustulipora nana*, of von Hagenow, is a subspiral form, and is included as a synonym in deference to the opinions of Hamm and Pergens. *E. filiformis*, Orb., is the same as *P. nana.* The *Bidiastopora rustica*, Orb., appears to be only a flattened branch of *E. virgula.* The variety *alternata* is accepted for a very primitive form, which d'Orbigny figured as *Entalophora alternata.* He subsequently transferred this species to *Filisparsa,* although on the very same figure he had founded a new species, *Idmonea subalternata.* Pergens includes this species in *Idmonea*; but the apertures are isolated and irregular, and not in transverse series, so that the affinities are Entalophoridan and not Idmonian.

Entalophora incerta, Vine, was described as having bulging nodes, a character suggestive of *Peripora*, but it was subsequently included by Vine in *E. raripora.*

The *Entalophora variegata,* of d'Orbigny, is, according to M. Pergens,[1] one of the Cheilostomata; in that case the original figures[2] are very misleading, for they suggest that the species is an *Entalophora*, closely allied to, if not identical with, the typical form of *E. virgula.* Some specimens in the collection from

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[1] Pergens: Revision, p. 374.

[2] D'Orbigny: Bry. Crét. p. 792, pl. 622, figs. 18–21.

Les Roches, one of the two localities whence d'Orbigny records this species, are very similar to the figures, but are certainly *Entalophora*. But, without re-examining the type, M. Pergens' opinion must be accepted.

The nearest ally of *E. virgula* among Lower Cainozoic species is *E. attenuata* (Stol.), from the German Oligocene. The figure of the type[1] of *E. attenuata* appears to be magnified ten diameters; if so, the zoœcia are ·5 mm. in diameter and the apertures ·3 mm. in width. In that case the zoœcia are larger than in the Cretaceous species, and thus *E. attenuata* may prove to be distinct.

LIST OF SPECIMENS.

British.

D. 461. A zoarium partly imbedded in flint: the typical *raripora* of d'Orbigny. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. X. Fig. 1.

D. 4516. Two zoaria (on flint). Middle Chalk. Chatham. Presented by Wm. Gamble, Esq., January, 1889. Figd. Pl. X. Fig. 2.

D. 2835. Three fragments of the var. *alternata*, Orb. (on slide). Upper Chalk. Bromley. Simmons Coll. Figd. Pl. X. Fig. 3.

D. 376. Four fragments of the var. *subgracilis*, Orb. (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. X. Fig. 4.

D. 4512. A base of a young specimen of form *raripora*, Orb. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XI. Fig. 2.

D. 1001. A worn basal fragment resembling *Entalophora variegata*, Orb. (on slide). Upper Chalk. Gravesend. Vine Coll. Figd. Pl. XI. Fig. 16.

B. 4447. A slide with six fragments of Bryozoa. Upper Greensand. Cambridge.
No. 1. *E. virgula*, typical form. Figd. Pl. XI. Fig. 18.
No. 2. Indeterminable.
No. 3. Basal part of *Spiropora macropora* (Orb.), var. *jessoni*. Pl. XI. Fig. 10.
No. 4. Basal fragment indeterminable.
Nos. 5 and 6. *Clinopora striatopora* (Vine).

Two of the fragments are recorded as the types of Vine's *E. raripora* (Proc. Yorks. Geol. Soc. vol. ix. pl. i. figs. 1, 2), and are therefore the types of *E. proboscidea*, var. *elegans*, Vine, 1889.

D. 1871. Six fragments on slide, identified by Vine as *E. proboscidea*, var. *elegans*, Vine. Polyz. Greensand, pt. ii.: Proc. Yorks. Geol. Soc. 1889, vol. xi. p. 260. Upper Greensand. Cambridge. Jesson Coll.
Nos. 1, 4, 5, and 6. *E. virgula* (Hag.).
Nos. 2 and 3. Indeterminable.

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[1] Stoliczka, Bry. Latdorf, Sitz. Ak. Wiss. Wien. vol. xlv. (1862), p. 77, pl. i. fig. 1; and von Reuss, Pal. Stud. ält. Tert. Alpen, II. Crosara, Denk. Ak. Wiss. Wien. vol. xxix. (1869), p. 286, pl. xxxvi. figs. 1, 2.

D. 4139. A branched zoarium of the typical form, 10 mm. long. Middle Chalk. Chatham. Gamble Coll.

D. 461. A similar specimen, 8 mm. long. Middle Chalk. Chatham. Gamble Coll.

D. 4082. A thin zoarium on flint, with *Spiropora macropora* (Orb.). Middle Chalk. Chatham. Gamble Coll.

D. 3281. Three fragments of different zoaria. Chalk Powder. Between Black Head and Gobbin, Magee Island. Presented by Jos. Wright, Esq.

D. 3280. A worn branched fragment, similar to the condition figured by d'Orbigny as *Entalophora santonensis* (Bry. Crét. pl. 623, figs. 15–17). Chalk Powder. Between Black Head and Gobbin, Magee Island. Presented by Jos. Wright, Esq.

D. 655. Two fragments of the form *subgracilis*, Orb. (on slide). Middle Chalk. Chatham. Vine Coll. Recorded by Vine as *Entalophora proboscidea, forma icaunensis.* Compl. Rep.: Rep. Brit. Assoc. 1893, p. 309.

D. 980. Six fragments of the forms *subgracilis*, Orb., and *raripora*, Orb. (on slide). Upper Chalk. Gravesend. Vine Coll. Recorded by Vine as *forma raripora* and *forma filiformis.* Compl. Rep. : Rep. Brit. Assoc. 1893, p. 309.

D. 950. Six well-preserved specimens (on slide); two are the form *raripora*, Orb., and four are the form *subgracilis*, Orb. Middle Chalk. Chatham. Vine Coll.

D. 3125. Two well-preserved specimens of form *raripora*, Orb., with highly raised peristomes (on slide). Upper Chalk. Kent (probably Bromley). Simmons Coll.

D. 652. Three zoaria (on slide); two specimens are the form *raripora*, Orb., and the third represents d'Orbigny's *Bidiastopora rustica.* Middle Chalk. Chatham. Vine Coll.

D. 650. Lower portions of two zoaria (on slide). Middle Chalk. Chatham. Vine Coll. Recorded by Vine as *E. proboscidea, forma rustica*, Vine. Compl. Rep. : Rep. Brit. Assoc. 1892, p. 309.

D. 656. Two fragments (on slide). Middle Chalk. Chatham. Vine Coll.

D. 374. Five fragments of form *raripora*, Orb. (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4589. A fragment of var. *alternata*, Orb. Chalk Detritus. Charing, Kent. T. R. Jones Coll.

D. 372. Three fragments of the typical form (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 373. Three specimens of form *raripora*, Orb., with highly raised peristomes (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 375. Three thick fragments of the typical form (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 659. Five fragments of var. *raripora*, Orb., and var. *subgracilis*, Orb. Middle Chalk. Chatham. Vine Coll.

? D. 982. A small fragment (on slide). Upper Chalk. Gravesend. Vine Coll. Identified by Vine as *E. proboscidea.*

? **D. 981.** Five small fragments (on slide). Upper Chalk. Gravesend. Vine Coll. Identified by Vine as *E. proboscidea*.

D. 5801. Three fragments (on slide). Chalk Detritus. Charing, Kent. T. R. Jones Coll.

D. 2722. A fragment of var. *raripora* (on slide). Middle Chalk. Chatham. Vine Coll.

? **D. 3253.** A small fragment with large apertures (possibly this species). Upper Chalk Powder. Ballytoben, Magee Island, N. Ireland. Presented by Jos. Wright, Esq.

D. 3274. A fragment of var. *subgracilis*. Upper Chalk Powder. Slieve Gallion, Derry. Presented by Jos. Wright, Esq.

D. 3275. A fragment of var. *subgracilis*. Upper Chalk Powder. Near White Abbey. Presented by Jos. Wright, Esq.

D. 2854. A worn fragment (on slide with *Entalophora pergensi*, Greg.). Chalk Detritus. Charing, Kent. T. R. Jones Coll.

D. 2618. Two fragments (on slide); one of them is var. *subgracilis*, Orb. Middle Chalk. Chatham. Vine Coll.

D. 2857. Four fragments (on slide). Chalk Detritus. Charing, Kent. T. R. Jones Coll.

D. 2644. Two fragments of var. *subgracilis*, Orb. (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2833. Three specimens of form *subgracilis*, Orb.; one of form *alternata*, Orb.; with one of *Entalophora pergensi*, Greg. (on slide). Upper Chalk. Bromley. Simmons Coll.

Foreign.

D. 651. Four fragments (on slide). Danian. Faxoe, Denmark. Vine Coll.

D. 3745. Two fragments (on slide). Senonian. L'Arche de Lèves. Gamble Coll.

D. 4712. A specimen of the typical form (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4711. A branch of var. *raripora*, Orb. (on slide). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

D. 4713. Two fragments of var. *subgracilis*, Orb. (on slide). Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4716. Two fragments of the typical form (on slide). Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4706. One fragment of var. *raripora* (on slide). Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 1381. Two branches (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 7055. A fragment (on slide). Cenomanian: Korycaner Schichter. Kank, Bohemia. Fric Coll.

D. 6450. Two fragments (on slide). Maastrichter Kreide. St. Pierre, Maastricht. Busk Coll.

D. 6453. Five fragments of var. *rustica* (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

D. 6454. One typical and two doubtful specimens of var. *nana* (on slide). Maastrichter Kreide. Fauquemont. Busk Coll.

D. 2903. Several fragments (on slide). Senonian: Maastrichtian. La Mare, Chapet, Seine-et-Oise. Presented by Prof. T. R. Jones.

D. 4707. Four small fragments of var. *raripora*, Orb. (on slide). Turonian: Craie marneuse. North of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4708. A branch of var. *raripora* (on slide). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

D. 4709. Four fragments of var. *raripora*, one of which is subverticillate (on slide). Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4710. A branched fragment of var. *raripora* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4598. Three fragments of var. *rustica* (Orb., *non* Hag.), on slide. Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4599. Two fragments of var. *rustica* (Orb., *non* Hag.), with a smaller fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4600. A branch of var. *rustica* (Orb., *non* Hag.), on slide. Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4717. A branched fragment (on slide). Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4720. A branch, possibly allied to *Entalophora variegata*, Orb. (on slide); *cf.* note on p. 222. Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4719. Two branches, possibly allied to *E. variegata*, Orb. (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4718. A small fragment (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4724. A fragment, possibly allied to *E. variegata*, Orb. (on slide). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

D. 4431. Twelve fragments. Cenomanian: Korycaner Schichten. Kank, Bohemia. A. Fric Coll., 1898.

D. 4427. A thick branch of the typical variety, 1·5 mm. in dia. Turonian: Iser Schichten. Vtelno, Bohemia. Fric Coll.

D. 4721. Two branches (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

2. Entalophora pergensi, nov.

SYNONYMY.

Entalophora proboscidea ? filiformis, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 309.

DIAGNOSIS.

Zoarium of long thin and very delicate branches, containing two or three zoœcia. The branches are cylindrical, well rounded or subangular in cross section.

Zoœcia very long. The peristomes are irregular in arrangement, and reflexed and well raised. The length of the reflexed portions is very variable.

Gonœcium small, conical.

DIMENSIONS.

	D. 4072.	D. 948.	D. 418.
Diameter of branch ...	·4 mm.	·3 mm.	·3 mm.
Diameter of zoœcia ...	·15 ,,	·15 ,,	·2 ,,
Diameter of aperture ...	·1 ,,	·1 ,,	·1 ,,
Length of exposed portions of zoœcia	2·0–2·5 ,,	1·8–2·5 ,,	1·5 ,,

DISTRIBUTION.

Upper Chalk: Bromley, Kent.
Middle Chalk: Chatham.
Chalk Detritus: Charing.

FIGURES.

Pl. X. Fig. 5. A fragment of a zoarium, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4072.**

Pl. X. Fig. 6. Fragment of another zoarium, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 948.**

Pl. X. Fig. 7. Another specimen with a gonœcium, × 6 dia. Middle Chalk: Chatham. Gamble Coll. **D. 418.**

AFFINITIES.

This long-celled delicate form resembles *Entalophora horrida* by the thinness of its zoœcia and by its sharply reflexed well-raised peristomes. The branches, however, are far more delicate than in that 'species,' the apertures are fewer and far more sparsely scattered. The specimen taken as the type was acquired by the Museum in the Gamble Collection, and had been determined as a new species by M. Pergens. With that opinion I concur, and therefore name the species after the distinguished Belgian bryozoologist.

Its nearest ally is probably *Entalophora geminata* (Hag.) of which it may be an especially thin variety. At first I was inclined to regard it as a deep-sea representative of that species, but as typical *E. geminata* occurs associated with *E. pergensi* at Chatham this explanation is erroneous, and it seems necessary to separate the two forms. *E. pergensi* is allied to the forms *iconensis* and *subgracilis* of *E. virgula* (Hag.).

LIST OF SPECIMENS.

D. 4072. Middle Chalk. Chatham (on slide). Gamble Coll. Figd. Pl. X. Fig. 5.

D. 948. A long angular specimen (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Entalophora proboscidea, forma filiformis*, Vine: Rep. Brit. Assoc. 1893, p. 309. Pl. X. Fig. 6.

D. 418. A small branch with a gonœcium, × 6 dia. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. X. Fig. 7.

D. 2854. A specimen (on slide) with *E. virgula* (Hag.). Chalk Detritus. Charing, Kent. T. R. Jones Coll.

D. 2833. A specimen (on slide) with *E. virgula* (Hag.). Upper Chalk. Bromley, Kent. Simmons Coll.

3. **Entalophora geminata** (von Hagenow), 1851.

Synonymy.

Pustulipora geminata, von Hagenow, 1851. Bry. Maastr. Kr. p. 20, pl. i. fig. 11.
Entalophora ,, d'Orbigny, 1853. Bry. Crét. p. 780.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 29.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 21.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, pp. 309, 330.
? ,, *carantina*, d'Orbigny, 1853. Bry. Crét. p. 784, pl. 753, figs. 16–18.

Diagnosis.

Zoarium of long, thin, dichotomous branches. The aspect is angular, as the walls of the zoœcia are flattened, and the zoœcia marked off by longitudinal ridges. The walls are punctulate.

Zoœcia long, with the apertures in pairs at some distance apart. The paired arrangement is, however, occasionally suppressed. In other cases a subverticillate arrangement results from the occurrence of two pairs of apertures at about the same level.

Peristome well raised.

Dimensions.

Diameter of a branch	·5 mm.
Diameter of zoœcia	·2 ,,
Diameter of aperture	·1 ,,
Distance between pairs of apertures	1·5 ,,

Distribution.

British:
Upper Chalk: Magee Island, North Ireland.
Middle Chalk: Chatham.

FOREIGN:

Senonian—Maastrichtian: Maastricht.
Campanian: Rügen.
Coniacian: Les Roches, Loir-et-Cher, in Craie de Villedieu.
Turonian: Villardin, Loir-et-Cher, in Craie marneuse.
? Cenomanian: Villers, Calvados; Le Mans, Sarthe. (Form *carantina.*)

FIGURE.

Pl. X. Fig. 8. Part of a zoarium, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 648.**

AFFINITIES.

This 'species' is characterized by its paired apertures and flat-faced zoœcia. It differs from *E. virgula* in both characters, but belongs to that group of 'species.' It is allied to *E. vassiacensis*, Orb., by the linear ornamentation and flat-facing, but in the Neocomian form the apertures are distributed with fair uniformity over the zoarium, and not grouped in pairs.

The most difficult question in the synonymy of this form is whether *Entalophora carantina*, Orb., should be included. Pergens has regarded that 'species' as a synonym of *E. proboscidea*. But d'Orbigny's figures show a bigeminal arrangement of the peristomes, and when two pairs happen to occur at the same level, an almost Spiroporan form results. Several of the Chatham specimens have the subspiroporiform arrangement. D'Orbigny's figures, however, represent the zoœcial walls as well rounded, and not flattened; and without an opportunity of examining his type, it is not safe to express any positive opinion.

LIST OF SPECIMENS.

BRITISH.

D. 648. A zoarium (on slide). Middle Chalk. Chatham. Vine Coll. Figd. Pl. X. Fig. 8.

D. 377. Two subverticillate fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 646. A specimen of the typical form (on slide). Middle Chalk. Chatham. Vine Coll., No. 39*a*.

D. 647. Three fragments of the subverticillate form (on slide). Middle Chalk. Chatham. Vine Coll., No. 39.

D. 649. Three fragments (on slide). Middle Chalk. Chatham. Vine Coll., No. 39*b*.

D. 3282. A fragment of the subverticillate variety. Upper Chalk Powder. Between Black Head and Gobbin, Magee Island. Presented by Jos. Wright, Esq.

FOREIGN.

D. 4688. A fragment of var. *carantina* (on slide). Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4689. Three fragments of var. *carantina* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

4. **Entalophora horrida,** d'Orbigny, 1851.

SYNONYMY.

Entalophora horrida, d'Orbigny, 1851–3. Bry. Crét. p. 789, pl. 621, figs. 13–15.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 20.
,, ,, Pergens, 1890. Revision, p. 361.

DIAGNOSIS.

Zoarium of fine cylindrical branches.

Zoœcia narrow, closely united except at the distal end, which is reflexed at right angles to the main axis.

Apertures irregularly arranged; with peristomes highly raised.

DIMENSIONS.

	Pergens.	B.M., D. 3276.
Diameter of branch ...	1·5 mm. ...	... ·5 mm.
Diameter of zoœcia ...	·12 ,, ...	... ·1 ,,
Diameter of aperture ...	·04 ,, ...	... ·04–·06 mm.

DISTRIBUTION.

BRITISH:

Upper Chalk: Slieve Gallion, Derry.

FOREIGN:

Senonian—Maastrichtian: Fécamp.
Campanian: Rügen.

FIGURE.

Pl. X. Fig. 9. Part of a zoarium, × 20 dia. Chalk Powder: Slieve Gallion, Derry. Presented by J. Wright, Esq. **D. 3276.**

AFFINITIES.

This Bryozoan is allied to *Entalophora pergensi*, Greg., by the small diameter of the zoœcia, which occur, however, in thicker branches, with numerous crowded peristomes; it also resembles *E. linearis* by the general character of the zoarium, but has much finer zoœcia.

D. 3276. A forked branch. Upper Chalk Detritus. Slieve Gallion, Derry. Presented by Jos. Wright, Esq. Figd. Pl. X. Fig. 9.

5. Entalophora echinata (Römer), 1840.

Synonymy.

Pustulopora	*echinata*,	Römer, 1840. Verst. nordd. Kr. p. 22, pl. v. fig. 23.
non ,,	,,	Michelin, 1845. Icon. Zooph. p. 211, pl. liii. fig. 5.
,,	,,	von Reuss, 1846. Verst. böhm. Kr. p. 64, pl. xiv. fig. 4.
,,	,,	von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
,,	,,	Kade, 1852. Los. Verst. Schanzenb. p. 31.
non ,,	,,	Fric, 1870. Pal. einz. Sch. böhm. Kr.: Arch. naturw. Landesf. Böhm. vol. i. p. 195.
Entalophora	,,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
? ,,	,,	d'Orbigny, 1851. Bry. Crét. pl. 622, figs. 15–17.
,,	*clavata*,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
,,	,,	d'Orbigny, 1851. Bry. Crét. pl. 621, figs. 8–12.
,,	,,	Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
Clavisparsa	,,	d'Orbigny, 1853. Bry. Crét. p. 776.
,,	,,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 21.
Entalophora	*filiformis*,	d'Orbigny, 1851–3. Bry. Crét. p. 791, pl. 622, figs. 1–4.
,,	*gracilis*,	d'Orbigny, 1851–3. *Ibid.* p. 783, pl. 617, figs. 1–4.
,,	*tenuis*,	d'Orbigny, 1851–3. *Ibid.* p. 786, pl. 619, figs. 10–12.
,,	,,	Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. roy. mal. Belg. vol. xxi. p. 206.
,,	*linearis*,	d'Orbigny, 1851–3. Bry. Crét. p. 792, pl. 622, figs. 5–7.
,,	*pulchella*,	von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 116, pl. xxix. fig. 3.
,,	,,	von Reuss, 1874. Bry. ob. Plän.: *ibid.* vol. xx. pt. 2, p. 133.
,,	*clava*,	Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 309.
Bidiastopora	*mariæ*,	Vine, 1893. *Ibid.* p. 310.

Diagnosis.

Zoarium of cylindrical or subclavate, dichotomous branches which are composed of numerous zoœcia. The distal ends of the zoœcia curve outwards, and are free for a considerable amount. The zoœcia and the apertures are irregularly arranged and widely spaced. In worn branches the apertures are flush with the surface of the solid axis of the branch, and in shape are elliptical.

Gonocyst irregular; closely adnate; affecting the area of from ten to thirty zoœcia.

DIMENSIONS.

	B.M. D. 657. mm.	B.M. D. 2613. mm.	B.M. D. 2612. mm.	B.M. D. 3108. mm.
Diameter of a branch ...	1·3	1	·68	·53
Diameter of zoœcia ...	·12–·18	·18, ·20, & ·24	·08–·18	·2
Diameter of aperture ...	·04–·08	·08–·12	·04–·1	·07
Distance of apertures ...	—	·6–·10	·3–·6	·6–1·0

DISTRIBUTION.

BRITISH:

Upper Chalk: Magee Island, Ireland; Kent.
Middle Chalk: Chatham.

FOREIGN:

Danian: Faxoe.
Senonian—Maastrichtian: Meudon; Fécamp, Seine-Inférieure; Châteaudun; Royan, Charente-Inférieure.
Santonian: Saintes, Charente-Inférieure.
Coniacian: Lisle, Vendôme, Les Roches, etc., Loir-et-Cher; Joué and Tours, Indre-et-Loire.
Turonian: Saint Germain, near Fleche, Sarthe; St. Rimay, Loir-et-Cher; Saxony, in Upper Pläner.
Albian: Grand Pré, Ardennes.
Cenomanian: Plauen, Saxony; Kank, Bohemia, in Korycaner Schichten.

FIGURES.

Pl. X. Fig. 10. Upper part of a subclavate zoarium with a gonocyst, and with especially large apertures; × 20 dia. Middle Chalk: Chatham. Vine Coll. **D. 657.**

Pl. X. Fig. 11. Part of a cylindrical branch with a smaller gonocyst; × 25 dia. Middle Chalk: Chatham. Vine Coll. **D. 2612.**

Pl. X. Fig. 12. Part of another specimen with similar gonocyst and the zoarium appearing from wear somewhat longitudinally striated; × 15 dia. Middle Chalk: Chatham. Vine Coll. **D. 2613.**

Pl. X. Fig. 13. A subclavate branch, with the surface much worn and the interzoœcial sutures all apparent; × 15 dia. Chalk: Kent. Bowerbank Coll. **D. 3108.**

Pl. XI. Fig. 17. A thin branch showing passage from the striated to the unstriated condition; × 11 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4066.**

Pl. XI. Fig. 1. Base of a zoarium, × 7 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4209.**

AFFINITIES.

Entalophora echinata was founded by Römer on a specimen from the North German plain. It was poorly figured, but there seems no adequate reason to doubt its specific identity with the specimens thus determined by von Reuss. Michelin, however, included in the species a Cenomanian Bryozoan on which d'Orbigny founded a new species, *E. vendinensis*; while the Senonian specimen which d'Orbigny at first figured as *E. echinata* he subsequently included in *E. subregularis.* Pergens leaves it there, and remarks (Revision, p. 361) that the figures are bad.

D'Orbigny's *E. linearis*, which appears to me synonymous with *E. echinata* (Röm.), is included by Pergens in *E. proboscidea.* It is undeniably nearly allied to *E. virgula*, the Cretaceous representative of the *proboscidea* group. But it appears to me that it can be distinguished from *E. virgula* with sufficient ease to make the distinction convenient. It differs from it by having a thicker zoarium, with more numerous zoœcia, the apertures of which are necessarily more crowded.

According to d'Orbigny the *P. benedeni*, Hag., is a synonym of *E. linearis.* But both Marsson and Hamm exclude *P. benedeni* from *E. linearis* and include it in *E. madreporacea* (Goldf.), apparently regarding it as only a young fragment or as the distal end of a branch of a larger zoarium. With this opinion I fully agree.

E. filiformis appears to represent the thinner distal ends of branches of *E. echinata.*

While approaching *E. virgula* in the condition of its thinner branches, this species similarly approaches *E. madreporacea* (Goldf.) in the character of its thicker branches, in which the apertures are crowded and tend to become subregular.

The Cenomanian and Turonian specimens referred by von Reuss to *Entalophora pulchella* appear to be the early forms of *E. echinata* with thin stems and narrow zoœcia.

The nearest Cainozoic ally of this species is the *Cricopora pulchella*, Rss.,[1] which has been accepted as a Cretaceous species by

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[1] Von Reuss. Polyp. Wien. Tertiarb.: Naturw. Abh. vol. ii. 1847, p. 40, pl. vi. fig. 10.

Pergens[1] and Canu.[2] But the former author assigns to *E. pulchella* zoœcia having a diameter of ·18 mm. to ·20 mm., and an aperture of ·06 mm. The best figures of the Cainozoic *E. pulchella* are those by Manzoni[3]; his figure 35*c* shows a specimen of the natural size and magnified about 17 dia.; calculated from this figure the zoœcia have a diameter of from ·35 to ·47 mm., and the aperture is ·15 to ·175 mm.

LIST OF SPECIMENS.

British.

D. 657. Upper end of a subclavate zoarium, with a gonocyst; the zoarium is a variety with large apertures. Middle Chalk. Chatham. Vine Coll. Recorded by Vine as *Entalophora clava*: Rep. Brit. Assoc. 1892, p. 309. Figd. Pl. X. Fig. 10.

D. 2613. Three fragments (on slide). One shows gonocyst; the thinnest fragment has the apertures distant, subquincuncial, with three apertures on one face of the stem. Middle Chalk. Chatham. Vine Coll. Figd. Pl. X. Fig. 12.

D. 2612. A fragment with gonocyst and somewhat regularly spiral peristomes. Middle Chalk. Chatham. Vine Coll., No. 48 A. Figd. Pl. X. Fig. 11.

D. 3108. A thin worn zoarium (on slide). Chalk. Kent. Bowerbank Coll. Figd. Pl. X. Fig. 13.

D. 4209. Three fragments (on slide). Two show basal attachments. The specific determination of basal fragments is uncertain, but comparison of the middle fragment on this slide with one of the two specimens, D. 4346, renders it probable that the specimen belongs to this species. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XI. Fig. 1.

D. 4066. Three specimens of the thin stalked variety. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XI. Fig. 17.

D. 521. Two distal ends of thick branches, 1·5 mm. in diameter, with some highly raised peristomes (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3135. A small, worn fragment (on slide). Upper Chalk. Kent. Simmons Coll.

D. 353. Three fragments of thick branches (on slide); the thickest fragment is 1·5 mm. in diameter, and has well-preserved peristomes. Middle Chalk. Chatham. Gamble Coll.

D. 653. A fragment of a stem, with a local spiral arrangement of the peristomes (on slide). Middle Chalk. Chatham. Vine Coll., No. 48. Identified as *Entalophora mariæ*, Orb., by Vine.

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[1] Pergens. Revision, p. 358. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi. 1892 (1893), Pr. Vb. p. 206.

[2] Canu. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 745.

[3] Manzoni. Bry. Mioc. Austr. Ungh.: Denk. Akad. Wiss. Wien. vol. xxxviii. pt. 2, 1878, pl. ix. fig. 35.

D. 658. Three fragments (on slide). Middle Chalk. Chatham. Vine Coll., No. 37. Identified as *Entalophora linearis*, Orb., by Vine.

D. 663. A branched fragment with the peristomes worn down (on slide). Middle Chalk. Chatham. Vine Coll., No. 47. Recorded as *Bidiastopora mariæ*, Orb., by Vine, 1893: Rep. Brit. Assoc. 1892, p. 310.

D. 4065. A small branched fragment (on slide). The number of zoœcia in the stem is small, and the peristomes irregular and distant. The specimen approaches the *raripora* form of *Entalophora virgula*. Middle Chalk. Chatham. Gamble Coll.

D. 3986. A well-preserved clavate zoarium, 1 mm. in diameter by 2·5 mm. high (on slide). Middle Chalk. Chatham. Gamble Coll. Similar to D. 657.

D. 2737. A fragment in the condition analogous to the *benedeni* variety of the *madreporacea* series; it has more distant and somewhat less regular apertures than the true *benedeni* (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2734. Another fragment of the same form (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4169. A thick, basal part of branch with *Clausa francqana*, Orb. (on flint). Middle Chalk. Chatham. Vine Coll.

D. 4076. Two fragments on flint. Middle Chalk. Chatham. Gamble Coll.

D. 430. Three fragments of thin branches (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4346. Two thick branches (on flints). Middle Chalk. Chatham. Gamble Coll.

D. 2719. A fragment of var. *filiformis*, the distal end of a branch (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2723. A branched fragment of var. *filiformis* (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2725. An irregular fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 3270. A small fragment of var. *filiformis*. Upper Chalk Powder. Between Black Head and Gobbin, Magee Island. Presented by Jos. Wright, Esq.

D. 2728. A fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4979. Fragment of a thin branch (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4948. Fragment of a branch (on slide). Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

D. 4695. A worn branch in the condition analogous to *benedeni* in the *madreporacea* series (on slide). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

D. 7057. A thin branch of the var. *pulchella*, Rss. (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

6. **Entalophora madreporacea** (Goldfuss), 1827.

SYNONYMY.

Ceriopora	*madreporacea*,	Goldfuss, 1827. Petref. Germ. p. 35, pl. x. figs. 12*a*, *b*.
,,	,,	Morren, 1828. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 39.
,,	,,	Klöden, 1834. Verst. Brand. p. 263.
,,	,,	Bronn, 1838. Leth. Geogn., 2nd ed., p. 594, pl. xxix. fig. 6.
,,	,,	von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 282.
,,	,,	von Reuss, 1846. Verst. böhm. Kr. p. 64, pl. xiv. fig. 5.
,,	,,	von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 598, pl. xxiii. *b*, fig. 14.
Pustulopora	,,	de Blainville, 1830. Zooph.: Dict. Sci. nat. vol. lx. p. 382.
Pustulipora	,,	de Blainville, 1834. Man. Act. p. 417, pl. lxx. fig. 5.
,,	,,	von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
,,	,,	von Hagenow, 1851. Bry. Maastr. Kr. p. 18, pl. i. fig. 8.
Entalophora	,,	d'Orbigny, 1851–4. Bry. Crét. p. 793, pl. 623, figs. 1–3.
,,	,,	*pars*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 28.
,,	,,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 20.
,,	,,	Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 205.
,,	,,	Ubaghs, 1888. Compt. Rend. Exc.: *ibid.*, Mém. vol. i. p. 233.
,,	,,	*pars*, Bucaille, 1890. Bry. Crét.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 507.
,,	,,	*forma inconstans*, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 309.
,,	,,	Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 207.
,,	,,	Pergens, 1895. Bry. Arche de Lèves: *ibid.* vol. viii. p. 136.
,,	,,	Pergens, 1895. Bry. Cachemb.: *ibid.* vol. viii. p. 182.
,,	*subregularis*,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
,,	,,	d'Orbigny, 1851. Bry. Crét. pl. 621, figs. 16–18.
,,	,,	*pars*, d'Orbigny, 1853. *Ibid.* p. 790.
,,	,,	*pars*, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. roy. mal. Belg. vol. xxi. p. 201.
,,	*benedeni*,	von Hagenow, 1851. Bry. Maastr. Kr. p. 17, pl. i. fig. 6.
? *Eschara*	*ehrenbergi*,	von Hagenow, 1840. Mon. Rüg. pt. ii.: N. Jahrb. 1840, p. 644, pl. ix. fig. 2.

Entalophora inconstans, d'Orbigny, 1853. Bry. Crét. p. 786, pl. 754, figs. 15–17.
,, ,, Pergens & Meunier, 1886. Bry. gar. Faxe: Ann. Soc. roy. mal. Belg. vol. xxi. p. 204.
,, *kolinensis*, Novak, 1877. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 109, pl. vii. figs. 11–13.
,, ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 33.

DIAGNOSIS.

Zoarium of cylindrical dichotomous branches. The apertures are crowded and quincuncial or subquincuncial; they occur in a more or less regular spiral.

Peristomes in well-preserved specimens well raised.

Gonœcium (? in all forms) simple and piriform; from two to four times the length of the zoœcia.

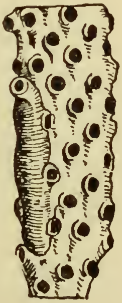

FIG. 25.—Part of a branch of var. *inconstans* with a long gonœcium; × 12 dia. Middle Chalk: Chatham. **D. 4532.**

DISTRIBUTION.

BRITISH:

Upper Chalk: Afton Downs, Isle of Wight. (Var. *inconstans.*)
Middle Chalk: Chatham. (Var. *inconstans.*)

FOREIGN:

Danian: Faxoe.
Senonian—Maastrichtian: Maastricht; Falkenberg; Ciply; Meudon; Royan, Charente-Inférieure; Fécamp, Seine-Inférieure.
Campanian: Rügen.
Santonian: L'Arche de Lèves; Cachembach.
Coniacian: Vendôme and Les Roches, Loir-et-Cher; Sainte Paterne, Luynes, and La Ribochère, Indre-et-Loire.

Turonian: Angoulême, Charente: St. Rimay and Villardin, Loir-et-Cher.
Cenomanian: Schillinge, near Bilin, in Lower Plänerkalk; Kutschlin, Bohemia, in Hippuritenkalk; Jiné, in Korycaner Schichten. (Var. *kolinensis.*)

FIGURES.

Pl. X. Fig. 14. Part of a branch of var. ***inconstans***; × 10 dia. Upper Chalk: Afton Downs, Isle of Wight. Presented by A. Hinton, Esq. **D. 2285.**

Pl. X. Fig. 15. Part of a branch in the form ***benedeni***; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4351.**

Pl. XI. Fig. 13. A branch of var. ***inconstans*** with gonœcium; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 4067.**

Fig. 25. Part of a branch of var. ***inconstans*** with a longer gonœcium; × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4532.**

AFFINITIES.

This 'species,' the first described of Cretaceous *Entalophoræ*, was founded by Goldfuss on a fragment from Maastricht which has fortunately been refigured by von Hagenow. The species differs from its nearest ally, *E. echinata* (Röm.), by the more regular and crowded arrangement of its apertures. The apertures are also less highly raised.

The English Chalk specimens have a narrow piriform gonœcium instead of an irregular large gonocyst: if this feature holds for the Continental representatives of the species, its difference from *E. echinata* is greater than the zoœcial arrangement alone would suggest.

The members of this species may be divided into four groups or varieties; of these divisions, *benedeni* may include only worn specimens of the typical form. The form *kolinensis* may be of specific value.

Var. **1. typica.**

VARIETAL CHARACTERS.

Branches formed of many zoœcia, a transverse section cutting across about forty.

Apertures small, circular, thin-lipped.

Gonœcium ?

DISTRIBUTION.

Senonian: France and Belgium.

DIMENSIONS.

Diameter of branch	·5–2·0 mm.
Diameter of zoœcia	·25–·3 ,,
Diameter of aperture	·08 ,,

Var. **2. inconstans,** d'Orbigny, 1853.

VARIETAL CHARACTERS.

Branches thin, and formed of not very numerous zoœcia.

Apertures rather large, circular, thin-lipped.

Gonœcium twice or thrice the length of the zoœcia; expanded at the proximal end.

DIMENSIONS.

	B.M. D. 2285.	B.M. D. 4699.	B.M. D. 4700.
Diameter of branch ...	1·3 mm. ...	1 mm. ...	1 mm.
Diameter of zoœcia ...	·25–·30 ,, ...	·2 ,, ...	·4 ,,
Diameter of aperture ...	·12–·15 ,, ...	·1 ,, ...	·2 ,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Afton Downs, Isle of Wight.
Middle Chalk: Chatham.

FOREIGN:

Danian: Faxoe.
Senonian—Coniacian: Les Roches, Loir-et-Cher.
Turonian: Angoulême; Villardin, Loir-et-Cher.

AFFINITIES.

This variety is very close to the typical Maastrichtian form, in which the gonœcium is not yet known. The English Chalk form is probably a representative of the Maastrichtian and Turonian form, but lived in a deeper sea. *Eschara ehrenbergi*, Hag., is probably this variety, but the branches are somewhat compressed, and a zoarial lamina is suggested in the original figure.

Var. **3. benedeni,** von Hagenow, 1851.

VARIETAL CHARACTERS.

Apertures flush with the surface of the zoarium; large and elliptical.

Gonœcium?

DISTRIBUTION.

Senonian: Belgium; France.

AFFINITIES.

This variety may be only a worn condition of the typical form.

Var. 4. **kolinensis**, Novak, 1877.

VARIETAL CHARACTERS.

Branches with numerous zooecia.

Apertures somewhat irregular, with thickened peristomes.

DISTRIBUTION.

Cenomanian: Bohemia.

LIST OF SPECIMENS.

BRITISH.

D. 2285. A branch of var. *inconstans*. Chalk. Afton Downs, Isle of Wight. Presented by A. Hinton, Esq. Figd. Pl. X. Fig. 14.

D. 4351. A fragment (on flint) with the apertures similar to those of var. *benedeni*. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. X. Fig. 15.

D. 2709. A branched fragment with the apertures approximating to those of var. *kolinensis* (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4532. A branch of var. *inconstans* (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. No. 25, p. 237.

D. 3988. A branched fragment of var. *inconstans* (on slide) with an indet. Eleid. Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

D. 4700. A branch of var. *inconstans* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4697. A branch of var. *inconstans* (on slide). Senonian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

? **D. 4698.** A branch (on slide). Coniacian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4699. A branch (on slide). Turonian: Craie marneuse. Villardin Stat. Purchased 1898.

D. 4597. A branch 1·5 mm. in dia. (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 714. A branch ·3 mm. in dia. (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 6451. A branch of var. *benedeni* (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

7. Entalophora vendinnensis, d'Orbigny, 1850.

SYNONYMY.

Entalophora vendinnensis,		d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,,	,,	d'Orbigny, 1851–3. Bry. Crét. p. 784, pl. 617, figs. 15–17.
,,	,,	von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 117, pl. xxix. figs. 4, 5.
,,	,,	Pergens, 1890. Revision, p. 362.
,,	,,	Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 152.
,,	,,	Canu, 1897. Bry. St. Cal.: *ibid.* p. 744.
Pustulopora	*echinata*	(*non* Röm.), Michelin, 1845. Icon. Zooph. p. 211, pl. liii. fig. 5.
,,	,,	(*non* Röm.), Fric, 1870. Pal. einz. Sch. böhm. Kr.: Arch. naturw. Landesf. Böhm. vol. i. p. 195.
Entalophora sarthacensis,		d'Orbigny, 1851. Bry. Crét. pl. 619, figs. 6–9.

DIAGNOSIS.

Zoarium of cylindrical branches, with small, crowded, bead-like apertures.

DISTRIBUTION.

Cenomanian: Le Mans, St. Calais, and Janières, Sarthe; Villers, Calvados; Friedrichberg, near Velim, and Weisskirchlitz, Bohemia, in Korycaner Schichten; Plauen, Saxony.

AFFINITIES.

Allied to *E. madreporacea*, but with smaller and less regularly arranged apertures.

D. 3678. A tufted zoarium and four branches. Cenomanian. Le Mans. Tesson Coll.

8. Entalophora crassa (d'Orbigny), 1853–4.

SYNONYMY.

Bidiastopora crassa,		d'Orbigny, 1853–4. Bry. Crét. p. 803, pl. 627, figs. 13–16.
,,	,,	Pergens, 1890. Revision, p. 367.

DIAGNOSIS.

Branches compressed; zoœcia thin. Apertures small and in subregular transverse series.

DIMENSIONS.

	D. 4596.
Diameter of branch	2 × 1 mm.
Diameter of aperture	·1–·12 ,,
Diameter of zoœcia	·15–·2 ,,

DISTRIBUTION.

Senonian—Maastrichtian: Royan, Charente-Inférieure.
Turonian: St. Rimay, Loir-et-Cher, in Craie marneuse.

D. 4596. A branch (on slide). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

9. Entalophora cretacea (d'Orbigny), 1850.

SYNONYMY.

Vincularia cretacea, d'Orbigny, 1850. Nouv. Bry. Crét.: Rev. Mag. Zool. ser. 2, vol. ii. p. 110.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 61.
,, ,, d'Orbigny, 1851. Bry. Crét. p. 63, pl. 600, figs. 17–19.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, pp. 315, 334.

DIAGNOSIS.

Zoarium of thin, dichotomous branches.

Zoœcia short and wide, flat-fronted, with prominent edges.

Apertures from five to seven in a single whorl or spiral: on the basal part of the branches they are quincuncial, passing upwards to an irregular spiral.

Gonœcia large, spherical protuberances. Their diameter is twice that of the thickness of the branch.

DIMENSIONS.

	D. 416.
Diameter of branch	·35 mm.
Diameter of zoœcia	·15 ,,
Diameter of aperture	·1 ,,
Distance of aperture	·4–·6 ,,
Diameter of gonœcium	·7 ,,

DISTRIBUTION.

ENGLAND:

Middle Chalk: Chatham.

FOREIGN:

Senonian—Maastrichtian: Fécamp.
Coniacian: Luynes, Indre-et-Loire, in Craie de Villedieu.
Turonian: St. Rimay, Loir-et-Cher, in Craie marneuse.

Figure.

Pl. XI. Fig. 12. A part of a zoarium with two gonœcia; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 416.**

Affinities.

The reference of these Chatham specimens to d'Orbigny's species *Vincularia cretacea* is open to some doubt. It was suggested by Vine, whose specimens thus labelled are in the Collection. That they are Entalophorids, and not Cheilostomata, appears unquestionable. They have a typically Cyclostomatous gonœcium, and the whole character of the zoœcia agrees with that of Entalophorids. That Vine was right in his specific reference appears probable. In the lower part of the stems the apertures are arranged as shown in d'Orbigny's figure; above, the apertures are less crowded and irregularly spiral.

LIST OF SPECIMENS.

British.

D. 416. A zoarium with two gonœcia. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XI. Fig. 12.

D. 2735. A branched zoarium. Middle Chalk. Chatham. Vine Coll.

D. 4354. An irregular zoarium. Middle Chalk. Chatham. Gamble Coll.

D. 2775. Two fragments (on slide). Middle Chalk. Chatham. Vine Coll. One specimen is a regular variety, and the other a doubtful specimen.

D. 637. A fragment (on slide) of an irregular variety. Middle Chalk. Chatham. Vine Coll., No. 111. Specimen recorded by Vine as *Vincularia cretacea*: Rep. Brit. Assoc. 1892, p. 315.

D. 4486. An isolated fragment (in tube). Middle Chalk. Chatham. Vine Coll.

D. 4488. A similar specimen. Middle Chalk. Chatham. Vine Coll.

D. 4068. Two specimens, each with a gonœcium; on slide with *Crisina* (*Tervia*) *subgracilis*, Orb. Middle Chalk. Chatham. Gamble Coll.

D. 3987. Three branches (on slide). Middle Chalk. Chatham. Gamble Coll. The smallest specimen agrees very closely with d'Orbigny's type.

D. 455. Three branches (on slide). Middle Chalk. Chatham. Gamble Coll.

Foreign.

D. 4693, D. 4695. Two branches (on slide). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

D. 4701, D. 4723. Two branched fragments, of which the former has the apertures crowded as in d'Orbigny's type (on slides). Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.

D. 4722. Two fragments (on slide). Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

10. Entalophora gigantopora, Vine, 1885.

SYNONYMY.

Entalophora gigantopora, Vine, 1885. Cambr. Greensd.: Proc. Yorks. Geol. Soc. vol. ix. p. 17, pl. i. fig. 3.
,, ,, Vine, 1889. Polyz. Greensd.: *ibid.* vol. xi. p. 262.

DIAGNOSIS.

Zoarium of laterally compressed branches.

Zoœcia short and wide. Apertures very large; arranged irregularly quincuncial.

DIMENSIONS.

	B.M., B. 4450.
Diameter of branch	1·5 mm.
Diameter of zoœcia	·4 ,,
Diameter of aperture	·3 ,,

DISTRIBUTION.

Chalk Marl: Kent.
Upper Greensand: Cambridge.

AFFINITIES.

This species is characterized by its wide, short zoœcia, large apertures, and laterally compressed branches.

FIGURE.

Pl. XI. Fig. 4. Part of a branch, × 10 dia. Upper Greensand: Cambridge. Jesson Coll. **B. 4450.**

LIST OF SPECIMENS.

B. 4450. Two fragments (on slide). Upper Greensand. Cambridge. Jesson Coll. Figd. Pl. XI. Fig. 4.

D. 1867. Five fragments, including the type of the species (on slide). Upper Greensand. Cambridge. Jesson Coll. Figd. Vine.

D. 6510. A fragment (on slide). Chalk Marl. Kent. Busk Coll.

11. Entalophora ramosissima, d'Orbigny, 1850.

SYNONYMY.

Entalophora ramosissima, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,, ,, d'Orbigny, 1851-3. Bry. Crét. p. 785, pl. 618, figs. 1-5.

? *Entalophora ramosissima*, Sharpe, 1854. Grav. Farr.: Quart. Journ. Geol. Soc. vol. x. p. 191.
? ,, ,, Keeping, 1883. Foss. Neoc. Upware, p. 137.
,, ,, Pergens, 1890. Revision, p. 361.
,, ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 507.
,, ,, Peron, 1893. Brach. Bry., etc., Tunisie, p. 340.
,, ,, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 152.
,, ,, Canu, 1897. Bry. St. Cal.: *ibid.* p. 744.

DIAGNOSIS.

Zoarium of thin cylindrical branches rising from a discoid base.

Apertures large and crowded; irregularly quincuncial. There is a tendency towards the occurrence of zones bare of apertures, as in *Peripora*.

Peristomes often well raised.

DIMENSIONS.

	Pergens.
Diameter of branches	2 mm.
Diameter of zooecia	·26–·30 ,,
Diameter of aperture	·16 ,,

DISTRIBUTION.

Cenomanian: Le Mans, St. Calais, and Janières, Sarthe; Villers, Calvados; Havre; Foum Tamesmida, Tunis.

AFFINITIES.

MM. Pergens and Canu include with this species the Bryozoan figured by Michelin as *Pustulopora pustulosa* (Icon. Zooph. pl. liii. fig. 4), which is clearly the same as d'Orbigny's *Laterotubigera cenomana*. The specimens in the Museum collection, which are no doubt the same as d'Orbigny's *E. ramosissima*, show, however, no approach to the well-marked verticillate arrangement of Michelin's *pustulosa* and d'Orbigny's *L. cenomana*. Accordingly I follow d'Orbigny in keeping the two forms distinct.

LIST OF SPECIMENS.

D. 3683. A complete zoarium. Cenomanian. Le Mans, Sarthe. Tesson Coll.
D. 3688. Four fragments. Cenomanian. Le Mans, Sarthe. Tesson Coll.
D. 3689. A branched zoarium. Cenomanian. Le Mans, Sarthe. Tesson Coll.

12. Entalophora fecunda, Novak, 1877.

SYNONYMY.

Entalophora fecunda, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 107, pl. vi. figs. 22–27.
,, ,, Pocta, 1892. Mech. Koryc.: Ceska Ak. Cis. Fr. Jos. Praze, sect. ii. p. 20, pl. ii. figs. 17, 18; pl. iii. figs. 14, 15.

DIAGNOSIS.

Branches irregularly cylindrical. Zoœcia large; apertures irregular in arrangement, or in subspiral or transverse rows. Apertures often transversely elongate.

Peristomes well raised.

DISTRIBUTION.

Cenomanian: Kamajk, Velim, Zbislav, Kank, and Jiné, Bohemia, in Korycaner Schichten.

AFFINITIES.

Parts of some zoaria of this species approximate to *E. madreporacea*, var. *kolinensis*.

LIST OF SPECIMENS.

D. 4429–30. Twelve fragments. Cenomanian: Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7053. Five thick branches (on slide). Cenomanian: Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7054. A thin forked branch (on slide). Cenomanian: Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7052. A worn branch (on slide). Cenomanian: Korycaner Schichten. Kank, Bohemia. Fric Coll.

13. Entalophora anomalissima, Novak, 1877.

SYNONYMY.

Entalophora anomalissima, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 105, pl. vii. figs. 14–16.
,, ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 20, pl. ii. figs. 19–22.
? *Discosparsa extranea*, Pocta, 1892. *Ibid.* p. 36, pl. iii. figs. 32–36.

DIAGNOSIS.

Zoarium of cylindrical stem, ending above in disc or cup-shaped expansion; or the zoarium may be only clavate.

Zoœcia on the stem very irregularly distributed. Zoœcia long; apertures rather above medium size; in places they are grouped into zones, but as a rule are widely scattered.

Peristomes well raised, especially in the zoœcia opening on the upper surface.

DIMENSIONS.

Height of zoarium	4 mm.
Diameter of the disc	3 ,,
Diameter of zoœcia	·2–·25 ,,
Diameter of apertures	·1–·12 ,,

DISTRIBUTION.

Cenomanian: Kamajk, Kank, and Jiné, Bohemia, in Korycaner Schichten.

AFFINITIES.

The *Discosparsa extranea* may be a young specimen of this species. It differs from *Discosparsa* by having zoœcia opening on the stem. This species is of interest as marking the passage from the normal cylindrical *Entalophoræ* to Entalophorids with a cupuliform zoarium, such as *Clypeina*.

D. 4426. Three fragments (on slide). Korycaner Schichten. Kamajk, Bohemia. Fric Coll.

14. Entalophora gamblei, nov.

DIAGNOSIS.

Zoarium with a large, irregular, encrusting base. The branches of the base are at first uniserial, but expand immediately into multiserial, proboscinoid shoots. These shoots divide, and the thin erect cylindrical branches arise from the points of furcation.

Zoœcia at first fusiform. In the multiserial parts they are regular and cylindrical, and fairly long. Apertures irregularly scattered.

DIMENSIONS.

	D. 460.
Width of rootlet series of the base	·5–1 mm.
Diameter of stem at base	·3 ,,
Diameter of zoœcia	·15 ,,
Diameter of aperture	·08 ,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURES.

Fig. 26. Part of a zoarium, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 460.**

Fig. 27. Another zoarium, with the bases of several erect stems; × 6 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3871.**

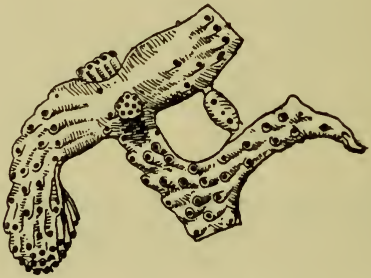

FIG. 26.—*Entalophora gamblei.* Base of a zoarium.

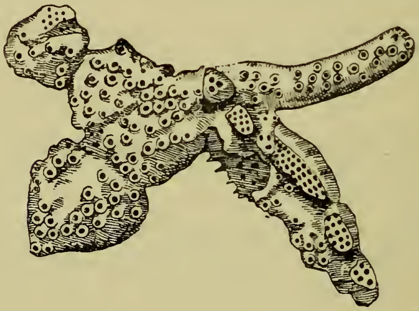

FIG. 27.—*Entalophora gamblei.* Base of a zoarium.

AFFINITIES.

This species is characterized by its large, irregular, proboscinoid base. The features of the stem are unknown; but the bases of most of the British Chalk *Entalophoræ* are known. I am unable to connect this species with any of them.

The species is of interest, as most other *Entalophoræ* have a berenicoid base.

In reference to this species it is necessary to consider the genus *Filifascigera* of d'Orbigny (Bry. Crét. p. 684). It consists of adnate proboscinoid shoots, which end in short groups of openings. The affinities of this genus depend on whether these groups of openings are to be regarded as groups of apertures or as the broken tubes of the zoœcia. The latter explanation seems the more probable, especially in the case of *F. megæra*; for so far as may be judged from Lonsdale's[1] figure, the groups look like the transverse sections across broken Entalophoroid shoots.

If such be the case, then *Filifascigera* is founded on the adnate base of an Entalophorid, though not of *Entalophora*, since in the known bases of that genus there are numerous apertures along the basal shoots or on the disc.

If, however, the groups of orifices are true apertures, then the genus is an Osculiporid, with an adnate zoarium composed of proboscinoid shoots.

LIST OF SPECIMENS.

D. 460. A zoarium encrusting an *Inoceramus*. Middle Chalk. Chatham. Gamble Coll. Figd. No. 26.

D. 3871. A zoarium encrusting a fragment of *Echinocorys* (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. No. 27.

D. 3872. A smaller zoarium with clavate shoots (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3874. A reticulate base on an echinid fragment. Middle Chalk. Chatham. Gamble Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. ? **arbuscula** (Leymerie), 1851.

SYN. *Escharites arbuscula*, Leymerie, 1851. Type Pyren. par. à Craie: Mém. Soc. géol. France, ser. 2, vol. iv. p. 192, pl. ix. fig. 9.

CHAR.—Zoarium of thick, cylindrical, dichotomous branches. (Surface destroyed.)

DISTRIB.—Senonian—Maastrichtian: Bois de la Barade, near Gensac, Haute-Garonne, in Calcaire à Orbitolites.

2. **brevissima**, d'Orbigny, 1851–3.

SYN. *Entalophora brevissima*, d'Orbigny, 1851–3. Bry. Crét. p. 794, pl. 625, figs. 5–10.
,, ,, Pergens, 1890. Revision, p. 363.

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[1] Lonsdale. Cret. Cor. New Jersey: Quart. Journ. Geol. Soc. vol. i. 1845, p. 69.

CHAR.—Zoarium of short, thick, and truncate branches, with irregular peristomes, which are perhaps more raised than in *S. variabilis.*

DISTRIB.—Senonian—Coniacian : Tours, Indre-et-Loire.

3. **compressa,** d'Orbigny, 1850.

SYN. *Entalophora compressa,* d'Orbigny, 1850. Prod. Pal. vol. ii. p. 801.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 619, figs. 1–5.
,, ,, *pars,* Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 508.
Bidiastopora ,, d'Orbigny, 1854. Bry. Crét. p. 801.
,, ,, Pergens, 1890. Revision, p. 367.
,, *gracilis,* d'Orbigny, 1853–4. Bry. Crét. p. 802, pl. 755, figs. 10–12.
,, ,, Pergens, 1890. Revision, p. 375.
,, *mariæ,* d'Orbigny, 1853–4. Bry. Crét. p. 804, pl. 755, figs. 13–15.

CHAR.—Branches laterally compressed: zoœcia in lower parts regularly quincuncial, or in a loose spiral; above, the branches end in a long tapering point, with more raised peristomes, less regularly arranged (form *gracilis*).

DISTRIB.—Senonian—Coniacian: Vendôme, Loir-et-Cher.
Cenomanian: Le Mans, Sarthe; Villers, Calvados.

4. **conjugata,** von Reuss, 1872–3.

SYN. *Entalophora conjugata,* von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 117, pl. xxix. fig. 8.

CHAR.—Zoarium thorny in aspect. Apertures in groups of two or three. A median and two lateral series, so that the aspect is somewhat Tervian.

DISTRIB.—Cenomanian—Lower Quader: Saxony.

AFF.—A Cenomanian ally of *E. geminata* (Hag.).

5. **conradi,** Gabb & Horn, 1862.

SYN. *Entalophora conradi,* Gabb & Horn, 1862. Mon. Polyz. N. Amer.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 170, pl. xxi. fig. 59.

CHAR.—Cylindrical branches, containing few short zoœcia, with the peristomes so much worn down that the apertures are elliptical. It is probably an ally of the *linearis* group.

DISTRIB.—Turonian: Near Mullica Hill, New Jersey, U.S.A.

6. **costulata** (von Hagenow), 1850. (Name only.)

SYN. *Pustulopora costulata,* von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.

DISTRIB.—Senonian—Campanian: Rügen.

7. ? **cultrata** (d'Orbigny), 1851-4.

SYN. *Bidiastopora cultrata*, d'Orbigny, 1851-4. Bry. Crét. p. 803, pl. 627, figs. 9-12.
,, ,, Pergens, 1890. Revision, p. 375.

CHAR.—? A *Porina*.

DISTRIB.—Senonian—Maastrichtian: Sainte Colombe, Manche.

8. ? **dispar** (Stoliczka), 1872.

SYN. *Ceriopora dispar*, Stoliczka, 1872. Pal. Ind.: Cret. Fauna S. Ind. vol. iv. pt. 2, p. 26, pl. iii. figs. 1-3.

CHAR.—Stem stout, with crowded, quincuncial apertures, sometimes rather irregular in arrangement.

DISTRIB.—Turonian—Arrialoor Group: Poodoopolliam, S. India.

9. **elegans** (d'Orbigny), 1853-4.

SYN. *Bidiastopora elegans*, d'Orbigny, 1853-4. Bry. Crét. p. 802, pl. 627, figs. 5-8.
,, ,, Pergens, 1890. Revision, p. 367.

CHAR.—Branches laterally very compressed. Zoœcia small. Apertures in slightly curved rows. Peristomes fairly raised.

DISTRIB.—Senonian—Maastrichtian: Meudon; Royan, Charente.
Coniacian: Sougé, Loir-et-Cher.

10. ? **fissa** (von Hagenow), 1839.

SYN. *Ceriopora fissa*, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 283.
Pustulopora fissa, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.

CHAR.—Generically indeterminable.

DISTRIB.—Senonian—Campanian: Rügen.

11. ? **gracilis** (Woodward), 1883.

SYN. *Millepora gracilis*, Woodward, 1833. Geol. Norf. p. 46, pl. iv. fig. 15.

CHAR.—Indeterminable.

DISTRIB.—Upper Chalk: Norwich.

12. **heros**, Pocta, 1892.

SYN. *Entalophora heros*, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 20, pl. ii. figs. 25-30.

CHAR.—Zoarium of thick and often clavate branches. Apertures of medium size (·1 mm. dia.); crowded; irregular below; above becoming arranged in transverse series.

DISTRIB.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

13. inornata (d'Orbigny), 1853–4.

Syn. *Bidiastopora inornata*, d'Orbigny, 1853–4. Bry. Crét. p. 801, pl. 784, figs. 9–11.
Entalophora ,, Pergens, 1890. Revision, p. 361.

Char.—Branches laterally compressed, tapering to a blunt point. Zoœcia quincuncial; wide; rather large; ? fusiform.

Distrib.—Aptian: Les Croutes, Aube.

14. intermedia, Hamm, 1881.

Syn. *Entalophora intermedia*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 28.

Char.—Described as intermediate between *E. madreporacea* and *Pustulopora tubulosa*, Hag., and therefore possibly the same as *E. echinata*, having irregularly arranged, prominent peristomes.

Distrib.—Senonian—Maastrichtian: Maastricht.

15. juvenis, Pocta, 1892.

Syn. *Entalophora juvenis*, Pocta, 1892. Mech. Koryc. Hory: Ceska Akad. Fr. Jos. Praze, sect. ii. p. 21, pl. iv. figs. 19, 20.

Char.—Zoarium of clavate branches, with large and very irregularly arranged zoœcia. Apertures large (·13 mm. dia.).

Distrib.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

16. neocomiensis, d'Orbigny, 1850.

Syn. *Entalophora neocomiensis*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 87.
,, ,, d'Orbigny, 1851–3. Bry. Crét. p. 782, pl. 616, figs. 15–18.
,, ,, de Loriol & Gillièron, 1869. Urg. Land.: Mém. Soc. helvet. Sci. nat. vol. xxiii. p. 39, pl. ii. fig. 19.

Char.—Zoarium of cylindrical branches, with distant, irregularly arranged apertures. Zoœcia of small diameter.

Distrib.—Neocomian: France and Switzerland.

Aff.—Allied to *E. echinata.*

17. neocomiensis (d'Orbigny), 1853–4.

Syn. *Bidiastopora neocomiensis*, d'Orbigny, 1853–4. Bry. Crét. p. 800, pl. 784, figs. 9–11.

Char.—Zoarium of laterally compressed branches. Apertures irregularly arranged; peristomes well raised.

Distrib.—Neocomian: Sainte Croix, Vaud.

Aff.—Pergens includes this species as a synonym in the series of *Entalophora neocomiensis*, *Laterotubigera flexuosa*, etc.

18. ?**nitida** (von Hagenow), 1850. (Name only.)

Syn. *Pustulopora nitida*, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.

Distrib.—Senonian—Campanian: Rügen.

19. **pavimentata**, Stoliczka, 1872.

Syn. *Entalophora pavimentata*, Stoliczka, 1872. Cret. Fauna S. Ind. vol. iv. pt. 2, p. 32, pl. iii. fig. 11.

Char.—Zoarium of thick branches. Apertures large, usually irregularly distributed, but in places in subregular, oblique series.

Distrib.—Turonian—Arrialoor Series: Yermanoor, S. India.

Aff.—The species is founded on a worn fragment, and is apparently allied to *E. geinitzi*.

20. ?**quadrangularis**, Gabb & Horn, 1862.

Syn. *Entalophora quadrangularis*, Gabb & Horn, 1862. Mon. Polyz. N. Amer.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 170, pl. xxi. fig. 58.

Char.—Indeterminable; the zoœcia are said to have emarginate lips. Unless this be due to unequal wearing down of the peristome, the species is probably Cheilostomatous.

Distrib.—Turonian: Timber Creek and ? Mullica Hill, New Jersey, U.S.A.

21. **regularis** (d'Orbigny), 1853–4.

Syn. *Bidiastopora regularis*, d'Orbigny, 1853–4. Bry. Crét. p. 806, pl. 756, figs. 4–6.

Char.—Zoarium of narrow, laterally compressed branches, composed of few zoœcia with transversely elongate apertures.

Distrib.—Senonian—Coniacian: Sougé and Trôot, Loir-et-Cher.

Aff.—Pergens (Revision, p. 362) includes this form as a synonym of *E. madreporacea*.

22. **rugosa**, d'Orbigny, 1853–4.

Syn. *Entalophora rugosa*, d'Orbigny, 1853–4. Bry. Crét. p. 795, pl. 754, figs. 18–20.

,, *proboscidea*, var. *rustica*, Pergens, 1890. Revision, p. 360.

Char.—Zoarium of cylindrical branches, with large zoœcia, with the surface transversely ribbed. Apertures large, subquincuncial.

Distrib.—Senonian: Vendôme and Trôot, Loir-et-Cher; Veules, Seine-Inférieure.

23. **salevensis,** de Loriol, 1863.

Syn. *Entalophora salevensis*, de Loriol, 1863. Invert. Mt. Salève, pt. ii. p. 129, pl. xvi. figs. 4*a–d*.
,, ,, de Loriol & Gillièron, 1869. Urg. Land.: Mém. Soc. helvet. Sci. nat. vol. xxiii. p. 38, pl. ii. fig. 20.

Char.—Tufted zoarium: branches 2 mm. thick, and formed of about twenty zoœcia in any section. Apertures quincuncial or somewhat irregular in distribution; rather crowded. Peristomes slightly raised.

Distrib.—Rhodanian: Landeron, near Neufchatel.
Hauterivian: Mont Salève.

24. **soror,** Pocta, 1892.

Syn. *Entalophora soror*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 21, pl. iii. figs. 9–13.

Char.—Branches long, cylindrical. Zoœcia fine. Apertures small (·03 to ·04 mm. dia.), distant, irregularly arranged. Large, lateral gonocyst.

Distrib.—Cenomanian: Kank, Bohemia, in Korycauer Schichten.

25. ? **spinosa** (von Hagenow), 1840.

Syn. *Ceriopora spinosa*, von Hagenow, 1840. Mon. Rüg. ii.: N. Jahrb. p. 646.
Pustulopora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.

Char.—Zoarium of slender branches, marked externally by longitudinal lines. Apertures in four rows on alternate thorn-like processes, raised at right angles to the circular intermediate areas.

Distrib.—Senonian—Campanian: Rügen.

Aff.—Generic position indeterminable.

26. ? **subacuta** (Peron), 1888.

Syn. *Bidiastopora subacuta*, Peron, 1888. Craie S.E. Bassin Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. p. 347, pl. iii. fig. 27.

Char.—Branches much compressed. Apertures regularly arranged; subpinnate.

Distrib.—Senonian—Campanian: Reims.

27. **symetrica,** d'Orbigny, 1853–4.

Syn. *Entalophora symetrica*, d'Orbigny, 1853–4. Bry. Crét. p. 796, pl. 755, figs. 4–6.
,, ,, Pergens, 1890. Revision, p. 362.
,, *pustulosa* (*non* Goldf.), d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
,, ,, (*non* Goldf.), d'Orbigny, 1853–4. Bry. Crét. p. 795, pl. 755, figs. 1–3.
,, ,, var. *recta*, Pergens, 1890. Revision, p. 363.

Char.—Zoarium of thick, cylindrical branches, with subquincuncial apertures which are large (var. *symetrica*) or small (var. *pustulosa*).

Distrib.—Senonian—Maastrichtian: Royan.
Santonian: Saintes.
Turonian: Martigues, Bouches du Rhône; Merpins, Charente.

Aff.—The relations of the varieties *symetrica* and *pustulosa* are analogous to those of the *macropora* and *micropora* forms of *Spiropora macropora*.

28. **triangularis** (d'Orbigny), 1853–4.

Syn. *Bidiastopora triangularis*, d'Orbigny, 1853–4. Bry. Crét. p. 805, pl. 755, figs. 16–18.
Entalophora ,, Pergens, 1890. Revision, p. 363.

Char.—Branches triangular in section; zoœcia thin, irregularly arranged. Peristomes crowded and well raised.

Distrib.—Senonian—Maastrichtian: Royan, Charente-Inférieure.

29. **tubulosa** (von Hagenow), 1851.

Syn. *Pustulipora tubulosa*, von Hagenow, 1851. Bry. Maastr. Kr. p. 16, pl. i. fig. 2.
,, ,, Pergens, 1888. Age Tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 205.
Entalophora ,, Staring, 1860. Bod. Nederl. vol. ii. p. 400.

Char.—Branches stout, irregular. Peristomes highly raised and very irregular.

Distrib.—Senonian—Maastrichtian: Maastricht; Ciply.

30. **turbinata** (Marsson), 1887.

Syn. *Clavisparsa turbinata*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 21, pl. i. fig. 7.

Char.—An immature zoarium, 2 mm. high. It may be the base of an *Entalophora*.

Distrib.—Senonian—Campanian: Rügen.

31. **varapensis** (de Loriol), 1863.

Syn. *Laterotubigera varapensis*, de Loriol, 1863. Invert Néoc. Mt. Salève, p. 126, pl. xvi. fig. 1.

Char.—Zoarium of irregular, anastomosing branches. Zoœcia short; apertures crowded in irregular, transverse rows.

Distrib.—Hauterivian: La Varappe, near Geneva.

32. **vassiacensis**, d'Orbigny, 1853.

Syn. *Entalophora vassiacensis*, d'Orbigny, 1853. Bry. Crét. p. 782, pl. 753, figs. 13–15.
" ,, Pergens, 1890. Revision, p. 358.

Char.—Zoarium of small branches, with flat-fronted zoœcia and distant apertures.

Distrib.—Rhodanian: Vassy, Haute-Marne.

33. aulostoma (Hamm), 1881.

Syn. *Phalangella aulostoma*, Hamm, 1881. Bry. mastr. Ober-Sen. pt. i. p. 26.

Char.—Possibly the encrusting base of an *Entalophora*.

Distrib.—Senonian—Maastrichtian: Maastricht.

SPIROPORA, Lamouroux, 1821.

[Expos. Méth. p. 47.]

Synonymy.

Pustulopora, de Blainville.
Cricopora, de Blainville.
Entalophora, *pars*, Waters, etc.

Diagnosis.

Entalophoridæ in which the apertures of the zoœcia open in regular annular or spiral lines. Zoœcia regularly cylindrical, with widely open circular apertures.

Type Species.

Spiropora elegans, Lamouroux, 1821. Expos. Méth. p. 47, pl. lxxiii. figs. 19–22. Bathonian: France.

Affinities.

This genus is conveniently retained to include those Entalophorids in which the apertures occur in verticels or spirals. A certain irregularity occurs in some Cretaceous species of *Spiropora*, as also in the Cainozoic species described by Mr. Waters.[1]

1. Spiropora verticillata (Goldfuss), 1827.

Synonymy.

Ceriopora verticillata, Goldfuss, 1827. Petref. Germ. vol. i. p. 36, pl. xi. fig. 1.
,, ,, Morren, 1828. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 40.
,, ,, Archiac, 1846. Crét. Vers. Plat. centr.: Mém. Soc. géol. Fr. sér. 2, vol. ii. p. 78.

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[1] A. W. Waters. Foss. Cycl. Australia: Quart. Journ. Geol. Soc. vol. xl. (1884), p. 680. N. Ital. Bry. pt. ii.: *ibid.* vol. xlviii. (1892), p. 158.

Pustulopora verticillata, de Blainville, 1830. Zooph.: Dict. Sci. nat. vol. lx. p. 383.
,, ,, de Blainville, 1834. Man. Act. p. 418.
,, ,, M. Edwards, 1836. In Lamark, Hist. nat. Anim. sans Vert., 2nd ed., vol. ii. p. 315.
,, ,, Römer, 1840. Verst. nordd. Kr. p. 21.
Cricopora ,, Michelin, 1845. Icon. Zooph. p. 212, pl. liii. fig. 7.
non ,, ,, von Reuss, 1847. Polyp. Wien. Tert.: Naturw. Abh. vol. ii. p. 40, pl. vi. fig. 9.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 263.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 20, pl. i. fig. 12.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 30.
,, ,, Winkler, 1864. Musée Teyl.: Cat. Pal. livr. ii. p. 213.
,, ,, Schlüter, 1870. Reise südl. Schwed.: Neu. Jahrb. 1870, p. 939.
Spiropora ,, Staring, 1860. Bod. Nederl. vol. ii. p. 398.
,, ,, Beissel, 1865. Bry. Aach. Kr.: Nat. Verh. holl. maatsch. Wet. ser. 2, vol. xxii. p. 70, pl. viii. figs. 91–93.
,, ,, Simonowitsch, 1871. Bry. Essen. Grüns.: Verh. nat. Ver. preuss. Rheinl. vol. xxviii. p. 63.
,, ,, von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 118, pl. xxix. fig. 9.
,, ,, von Reuss, 1874. Bry. ob. Plän.: *ibid.* vol. xx. pt. 2, p. 134.
,, ,, Brauns, 1875. Sen. Salzb.: Zeit. Ges. Naturw. vol. xlvi. p. 400.
,, ,, Novak, 1877. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 110, pl. viii. figs. 6–12.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 29.
,, ,, Fric, 1883. Isersch.: Arch. naturw. Landesf. Böhm. vol. v. No. 2, p. 126, fig. 108.
,, ,, *pars*, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. roy. mal. Belg. vol. xxi. p. 207.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 22, pl. i. fig. 9.
,, ,, Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i., Pr. Vb. p. 205.
,, ,, Pergens, 1890. Revision, p. 364.
,, ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. pp. 507, 511.
,, ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 23.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 310.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 205.
,, ,, Pergens, 1895. Bry. Arche de Lèves: *ibid.* vol. viii. p. 136.
,, ,, Pergens, 1895. Bry. Cachemb.: *ibid.* vol. viii. p. 182.

Spiropora verticillata, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 153.
,, ,, Canu, 1897. Bry. St. Cal.: *ibid.* p. 746.
Entalophora ,, *pars*, Waters, 1844. Foss. Cycl. Austr.: Quart. Journ. Geol. Soc. vol. xl. p. 685.
,, ,, *pars*, Macgillivray, 1895. Tert. Polyz. Vict.: Trans. R. Soc. Vict. vol. iv. p. 140.
Milleporite, Faujas St. Fond, 1799. Hist. Mt. St. Pierre, p. 207, pl. xl. fig. 6.
Cricopora faujasi, de Blainville, 1830. Zooph.: Dict. Sci. Nat. vol. lx. p. 386.
,, ,, de Blainville, 1834. Man. Act. p. 421.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 21.
? *Seriatopora antiqua*, *pars*, Defrance, 1827. Dict. Sci. nat. vol. xlviii. p. 496.
Spiropora ,, *pars*, d'Orbigny, 1853. Bry. Crét. p. 710, pl. 745, figs. 14–19.
Ceriopora annulata (*non* Lam.), von Hagenow, 1839. Mon. Rüg.: Neu. Jahrb. 1839, p. 284, pl. v. fig. 5.
,, ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 599.
,, ,, von Reuss, 1846. Verst. böhm. Kr. p. 64, pl. xiv. figs. 2, 3.
,, ,, Giebel, 1848. Polyp. Quedl.: Zeit. Zool. Zoot. vol. i. p. 18.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 266.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 615, figs. 10–12.
Spiropora ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
Idmonea comptoniana, Mantell, 1844. Med. Creation, p. 288, fig. p. 284.
,, *comptoni*, Vine, 1884. Fourth Rep.: Rep. Brit. Assoc. 1883, p. 164.
Cricopora ligeriensis, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 266.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 615, figs. 13–15.
,, *lævigata*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 615, figs. 16–18.
,, *reussi*, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 21, pl. i. fig. 13.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 30.
,, *crassa*, d'Orbigny, 1851. Bry. Crét. pl. 615, figs. 1–3.
,, *cenomana*, d'Orbigny, 1851. *Ibid.* figs. 4–6.
Spiropora ,, d'Orbigny, 1853. *Ibid.* p. 708.
Cricopora interrupta, d'Orbigny, 1851. *Ibid.* pl. 615, figs. 7–9.
Spiropora neocomiensis, d'Orbigny, 1853. Bry. Crét. p. 708, pl. 742, figs. 1, 2.
,, ,, de Loriol, 1869. Urg. Land.: Mém. Soc. helvet. Sci. nat. vol. xxiii. p. 37, pl. ii. fig. 18.
Entalophora striatopora (*non* Vine), Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 507.

DIAGNOSIS.

Zoarium of cylindrical branches formed of verticels of zoœcia. The number of zoœcia in each verticel varies from five to over thirty. The branches divide dichotomously. The walls are punctate.

Apertures in regular rings round the stems; in young branches the rings are farther apart than the diameter of the branches, but in older branches the rings are relatively much nearer. A tendency to a spiral arrangement of the apertures occasionally occurs, and near a bifurcation the rings become somewhat irregular (var. *interrupta*).

Peristomes usually well raised.

DIMENSIONS.

	Fide Pergens.	B.M., No. D. 420.
Diameter of branch	·5–2 mm.	·5–1 mm.
Diameter of zoœcia	·24–·3 ,,	·2 ,,
Diameter of aperture	·1 ,,	·15 ,,
Distance of verticels	·75–3 ,,	1 ,,

DISTRIBUTION.

BRITISH.

Upper Chalk: Chichester; Bromley, Kent; Magee Island, North Ireland.

Middle Chalk: Chatham.

FOREIGN:

Danian: Stevn's Klint, Faxoe, Denmark.

Senonian—Maastrichtian: Maastricht; Geulheim; Ciply; Meudon; St. Germain, near Paris; Fécamp, Seine-Inférieure; Sainte-Colombe, Manche; Royan.

Campanian: Rügen; Schoonen; S. Sweden.

Santonian: Saintes, Perignac, Pons, etc., Charente-Inférieure; Cachembach and L'Arche de Lèves, Eure-et-Loir; Salzberg, near Quedlinburg, Hannover.

Coniacian: Vendôme, etc., Loir-et-Cher, and Tours, Luynes, Sainte-Paterne, La Ribochère, and Joué, Indre-et-Loire, in Craie de Villedieu.

Turonian: Martigues, Bouches-du-Rhône; Merpins, Charente; north of Les Roches, and St. Rimay, Loir-et-Cher, in Craie marneuse; Gross Ujezd and Lindenau, Bohemia, in Iser Schichten.

Cenomanian: Weisskirchlitz, Hradek, Schillinge, Kank, and Jiné, Bohemia, in Korycaner Schichten; Plauen, Saxony, in Lower Pläner; Le Mans, Le Malagne, St. Calais, and Janières, Sarthe; Essen.

Neocomian: Sainte-Croix, Vaud.

FIGURE.

Pl. XI. Fig. 5. Part of a zoarium with the apertures verticillate above and spiral below; × 7 dia. Middle Chalk: Chatham. Gamble Coll. **D. 420.**

AFFINITIES.

This is a typical member of the *Spiropora* group. It differs from the type of the genus[1] by having more delicate branches and more regular arrangement of the peristomes. *S. elegans* is most nearly allied to the *annulata* form.

D'Orbigny at first proposed a considerable series of specific names for forms which he subsequently included in two species. Marsson showed that one of them was a synonym of Goldfuss' *C. verticillata*, but kept d'Orbigny's *S. cenomana* distinct on account of the greater thickness of the branches. Pergens has included this 'species' also in *S. verticillata*, a course which I follow.

The *Cricopora verticillata* of Michelin appears to be the same form as that which d'Orbigny subsequently figured as *Cricopora interrupta*, and then merged as a variety or deformity of his *S. cenomana*. D'Orbigny's suggestion is probably correct.

The Australian Cainozoic Bryozoan referred to this 'species' by Waters and Macgillivray has a longer free peristome than I have seen in any Cretaceous specimen. Macgillivray's figure shows the free peristome as equal in length to the diameter of the internode above. The longest peristome of any specimen of *S. verticillata* in the Museum collection (**D. 664**) is only half that width. Macgillivray assigns to *S. verticillata* a range from the "Jurassic to late Tertiary," while Waters extends it backward as far as the Ordovician. But if any such range be given to the species its name must be altered to *S. elegans*.

The *Cricopora verticillata* of von Reuss is a Cainozoic representative of *S. macropora*, and not of the true *S. verticillata* of Goldfuss.

LIST OF SPECIMENS.

BRITISH.

D. 420. A branched fragment with the apertures verticillate above and spiral below. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XI. Fig. 5.

D. 3105. A fragment 8·5 mm. long, on flint. Upper Chalk. Bromley, Kent. Bowerbank Coll.

D. 664. Three fragments with well-raised peristomes, and one specimen indet. (on slide). Middle Chalk. Chatham. Vine Coll.

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[1] *Spiropora elegans*, Lamouroux. Expos. Méth. p. 47, pl. lxxiii. figs. 19–22.

D. 3985. Two fragments (on slide). Middle Chalk. Chatham. Gamble Coll.
D. 3279. A small fragment. Chalk Powder. Between Black Head and Gobbin, Magee Island. Presented by Joseph Wright, Esq.

Foreign.

D. 6369. Nine fragments (on slide). Maastrichter Kreide. Geulheim. Busk Coll.
D. 6370. Two fragments of var. *reussi* (on slide). Maastrichter Kreide. Maastricht. Busk Coll.
D. 6278. Two fragments (on slide). Mucronatenkreide. Rügen. Laur Coll.
D. 6277. Four fragments (on slide). Mucronatenkreide. Rügen. Laur Coll.
D. 4432. Five fragments. Turonian: Iser Schichten. Ujezd, Bohemia. Fric Coll.
D. 1286. Three fragments (on slide); the central specimen agrees with the typical form figured by Goldfuss. Cenomanian. Le Malagne, near Le Mans, Sarthe. Vine Coll.
D. 1287. Four specimens (on slide). Cenomanian. Le Malagne, near Le Mans, Sarthe. Vine Coll.
D. 1328. Two fragments identified by Vine as *S. verticillata*. In one case the determination is probably correct; the other fragment is different and indeterminable. Danian: Faxoe Kalk. Faxoe, Denmark. Vine Coll.
D. 3731. Two fragments of thin branches (on slide). Senonian. L'Arche de Lèves. Gamble Coll.
D. 3698. Three branched fragments. Cenomanian: Craie chloritée. Le Mans. Tesson Coll.
D. 4879. A fragment of var. *antiqua*. Turonian: Craie marneuse. North of Les Roches, Loir-et-Cher. Purchased 1898.
D. 4671. A fragment of var. *antiqua*. Turonian: Craie marneuse. St. Rimay, Loir-et-Cher. Purchased 1898.
D. 4880. A fragment of the *cenomana* form. Senonian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

2. **Spiropora macropora** (d'Orbigny), 1853.

Synonymy.

Laterotubigera	*macropora*,	d'Orbigny, 1853. Bry. Crét. p. 718, pl. 754, figs. 5–7.
Spiropora	,,	Pergens, 1890. Revision, p. 365.
,,	,,	Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 310.
,,	,,	Pergens, 1893. Bry. St. Paterne: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 205.
,,	,,	Pergens, 1895. Bry. Arche de Lèves: *ibid.* vol. viii. p. 136.
,,	,,	Pergens, 1895. Bry. Cachemb.: *ibid.* p. 183.
Entalophora	*cenomana*,	d'Orbigny, 1851. Bry. Crét. pl. 618, figs. 11–15.
? ,,	,,	Sharpe, 1854. Grav. Farr.: Quart. Journ. Geol. Soc. vol. x. p. 191.

Spiropora cenomana, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 23, pl. i. fig. 10.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 310.
Laterotubigera ,, d'Orbigny, 1853. Bry. Crét. p. 715, pl. 754, fig. 1.
,, ,, Simonowitsch, 1871. Bry. Essen. Grüns.: Verh. nat. Ver. preuss. Rheinl. vol. xxviii. p. 65.
Pustulopora pustulosa (*non* Goldf.), Michelin, 1845. Icon. Zooph. p. 211, pl. liii. fig. 4.
Entalophora transversa, d'Orbigny, 1851. Bry. Crét. pl. 622, figs. 8–10.
Laterotubigera ,, d'Orbigny, 1853. *Ibid.* p. 717.
Spiropora ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
Laterotubigera flexuosa, d'Orbigny, 1853. Bry. Crét. p. 716, pl. 754, figs. 2–4.
,, *annulato-spiralis*, d'Orbigny, 1853. Bry. Crét. p. 718, pl. 754, figs. 8–11.
Spiropora ,, Staring, 1860. Bod. Nederl. vol. ii. p. 398.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 29.
Semilaterotubigera annulata, d'Orbigny, 1853. Bry. Crét. p. 750, pl. 762, figs. 13–15.
Laterotubigera micropora, d'Orbigny, 1853. Bry. Crét. p. 719, pl. 754, figs. 12–14.
Spiropora macropora, var. *micropora*, Pergens, 1890. Revision, p. 365.
,, ,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 205.
,, *micropora*, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 310.
Entalophora jessoni, Vine, 1885. Notes Cambr. Gr.: Proc. Yorks. Geol. Soc. vol. ix. p. 15, pl. i. fig. 6.
,, ,, Vine, 1889. Polyz. Low. Gr.: *ibid.* vol. xi. p. 261.
,, *raripora*, *pars*, Vine, 1885. *Op. cit.* p. 14.
? ,, *neocomiensis*, Vine, 1885. *Op. cit.* p. 16, pl. i. fig. 4.
,, ,, Vine, 1889. *Op. cit.* p. 262.
Entalophora pulchella, *pars*, Pergens, 1890. Revision, p. 358.
,, ,, Pergens, 1895. Bry. Cachemb.: Bull. Soc. belge Géol. vol. viii., Pr. Vb. p. 135.

Diagnosis.

Zoarium of cylindrical branches, formed of numerous closely packed zoœcia. The branches divide irregularly or dichotomously.

Apertures regularly arranged in verticels or spirals. The series are crowded; they are always much closer than the diameter of the branches.

Peristomes fairly well raised.

DIMENSIONS.

	Pergens, p. 359.	Pergens, p. 365.	D. 946.	B. 4449. Type of *jessoni*.
Diameter of branch ...	—	—	1 mm.	·7 mm.
Diameter of zoœcia ...	·18–·20 mm.	·28–·36 mm.	·2–·25 ,,	·15–·17 ,,
Diameter of aperture ...	·06 ,,	·14 ,,	·12–·15 ,,	·12 ,,
Distance of rows of apertures	—	—	·5–·7 ,,	·4 ,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Salisbury; Bromley.
Middle Chalk: Chatham.
Chalk: Charing, Kent.
Upper Greensand: Cambridge (var. *jessoni*).

FOREIGN:

Senonian—Maastrichtian: Meudon; Fécamp, Seine-Inférieure; Royan.
Campanian: Rügen.
Santonian: Saintes, Charente-Inférieure; L'Arche de Lèves and Cachembach.
Coniacian: Vendôme, Lisle, Lavardin, etc., Loir-et-Cher; Joué, Tours, Sainte-Paterne, La Ribochère, etc., Indre-et-Loire.
Turonian: Angoulême and Merpins, Charente; Martigues, Bouches-du-Rhône; Villardin, Loir-et-Cher.
Cenomanian: Le Mans, Sarthe; Havre, Seine-Inférieure; Essen.

FIGURES.

Pl. XI. Fig. 6. Two parts of the same zoarium, showing verticillate and spiral arrangements of apertures; × 10 dia. Upper Chalk: Salisbury. Vine Coll. **D. 946.**

Pl. XI. Fig. 7. A fragment of the *micropora* variety, showing passage from verticillate to pinnate arrangement of apertures; × 7 dia. Middle Chalk: Chatham. Vine Coll. **D. 662.**

Pl. XI. Fig. 8. A hollow zoarium of the *Semilaterotubigera* variety. Fig. 8*a*, from the side; Fig. 8*b*, from the end: × 7 dia. Middle Chalk: Chatham. Gamble Coll. **D. 470.**

Pl. XI. Fig. 9. A specimen of the var. *jessoni*, × 10 dia. Upper Greensand: Cambridge. Vine Coll. **B. 4449.**

Pl. XI. Fig. 10. Part of base of stem of var. *jessoni*, × 10 dia. Upper Greensand: Cambridge. Vine Coll. **B. 4447.**

AFFINITIES.

This *Spiropora* differs from *S. verticillata* by the closer proximity of the transverse series of apertures. The synonymy is complicated, and it is improbable that any two bryozoologists would adopt the same limits for the species. At first I adopted Pergens' arrangement of this group; but that appears to me to involve two inconsistencies and to be unworkable. Pergens accepts *Spiropora*, but includes *Laterotubigera cenomana* as a variety of *Entalophora ramosissima*, characterized by the verticillate arrangement of the apertures. Hence the character on which *Spiropora* is accepted as a genus is elsewhere regarded as of less than specific value. Pergens, moreover, separates d'Orbigny's species *macropora* from the *flexuosa-annulato-spiralis* series, mainly on account of the size of the zoœcia and apertures; but he includes in *macropora*, as a variety, the form *micropora*, in which the apertures and zoœcia are as small as in the other series.

The dimensions of the zoœcia in this species seem to vary considerably. Thus, among d'Orbigny's series of species his *annulato-spiralis* (pl. 754, figs. 8–11) appears to be a young branch of the same form as *macropora* (pl. 754, figs. 5–7); the *flexuosa* (pl. 754, figs. 2–4) has more crowded, smaller zoœcia, and appears to be intermediate between the *macropora* and *micropora* (pl. 754, figs. 12-14) forms; the *cenomana* form (pl. 618, figs. 11–15) agrees with *flexuosa*; the *annulata* (pl. 762, figs. 13–15), as Pergens has shown, is a hollow specimen of the same form, though agreeing with the *micropora* rather than with *macropora*, in which Pergens placed it. The Upper Greensand form *jessoni* is a representative of the *macropora* series.

I have in vain endeavoured to separate this group of specimens into two species by the size of the apertures, dividing those with apertures of about ·06 mm.—according to Pergens' measurement for his *pulchella* series—from those in which it is from ·12 to ·15 mm. But Pergens himself remarks that "the difference of this species [*Spiropora macropora*] from *Spiropora* (*Entalophora*) *pulchella* is not strongly marked, and perhaps it is composed only of aged colonies."

The name *macropora* is inappropriate for the species, as it includes the *micropora* variety; but the specific name *cenomana* is no better, as the species is mainly Senonian, and as that name has been very loosely used, and is liable to be superseded on the ground that it had been previously used by d'Orbigny for a *Cricopora* which must be included in *Spiropora* (p. 258).

LIST OF SPECIMENS.

British.

D. 946. A fragment showing verticillate and spiral series of apertures. Upper Chalk. Salisbury. Vine Coll. Figd. Pl. XI. Figs. 6*a*, *b*.

D. 662. A fragment of a branch, showing transition from the verticillate to a pinnate or subspiral arrangement of the apertures. Middle Chalk. Chatham. Vine Coll. Figd. Pl. XI. Fig. 7.

D. 470. A tubular specimen with spiral apertures, passing from the var. *semilaterotubigera* into an irregular variety. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XI. Fig. 8.

D. 4517. A large cluster of branches. Upper Chalk. Bromley.

D. 4082. With *Entalophora virgula* (Hag.), on flint. Middle Chalk. Chatham. Gamble Coll.

D. 2700. A branched fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2708. A branched fragment with fourteen zoœcia in a whorl (on slide). Middle Chalk. Chatham. Vine Coll.

D. 3129. A small fragment (on slide). Upper Chalk. Kent. Simmons Coll.

D. 2855. A fragment with eight apertures in a circle (on slide). Chalk Detritus. Charing, Kent. T. R. Jones Coll.

D. 431. Four fragments (on slide). The largest specimen is var. *micropora*. Middle Chalk. Chatham. Gamble Coll.

D. 2713. A fragment of the hollow var. *semilaterotubigera*. Middle Chalk. Chatham. Vine Coll.

D. 3976. Three fragments of the hollow var. *semilaterotubigera* (on slide). One specimen shows rather distant series of apertures. Middle Chalk. Chatham. Gamble Coll.

D. 3989. Two branched fragments of the same (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2823. Three fragments with somewhat distant series of apertures, and thus approaching *S. verticillata* (Goldf.), on slide. Chalk Detritus. Charing, Kent. T. R. Jones Coll.

D. 1868. Five fragments (on slide). Upper Greensand. Cambridge. Jesson Coll.

D. 1873. Three fragments (on slide). Upper Greensand. Cambridge. Jesson Coll. One of them is labelled "? *E. neocomiensis*, Proc. Yorks. Geol. Soc. vol. xi. p. 262."

B. 4447. Basal part of a zoarium (on slide), with *Entalophora virgula* (Hag.). Upper Greensand. Cambridge. Vine Coll.

B. 4449. A fragment of a branch of var. *jessoni* (on slide). Upper Greensand. Cambridge. Vine Coll. The type of *E. jessoni*, Vine. Figd. Pl. XI. Fig. 9.

D. 7063. Two fragments of var. *jessoni* (on slide). Upper Greensand. Cambridge. Old Coll.

Foreign.

D. 4801. A fragment (on slide). Senonian—Coniacian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4803–5. Seven fragments (on three slides). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4873. Six fragments (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4802. A fragment of var. *flexuosa* (on slide). Senonian—Coniacian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4875. A fragment of var. *semilaterotubigera*. Turonian: Craie tuffeau. Villardin, Loir-et-Cher. Purchased 1898.

D. 3750. Two fragments (on slide). Senonian. L'Arche de Lèves. Gamble Coll.

D. 3615. A simple branch. Essener Grünsand. Essen. Purchased Damon, 1877.

D. 3616. A worn branch. Essener Grünsand. Essen. Purchased Damon, 1877.

DOUBTFUL AND UNREPRESENTED SPECIES.

1. ?**borchardti** (von Hagenow), 1850.

Syn. *Cricopora borchardti*, von Hagenow, 1850. In Geinitz, Quadersandst. p. 238.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 30.

Char.—Undescribed.

Distrib.—Senonian—Campanian: Rügen.

2. **calamus**, Gabb & Horn, 1862.

Syn. *Spiropora calamus*, Gabb & Horn, 1862. Mon. Foss. Polyz. N. Amer.: Journ. Acad. Sci. Nat. Phil. ser. 2, vol. v. p. 166, pl. xxi. fig. 55.

Char.—Gabb & Horn's descriptions and figures do not show any character by which this Bryozoan can be separated from *S. verticillata*. But the fragment described is insufficient for certain determination.

Distrib.—Turonian: Timber Creek, New Jersey.

Aff.—According to Pergens and Meunier this is a synonym of *S. verticillata*.

3. **cingulata**, Credner, 1864.

Syn. *Spiropora cingulata*, Credner, 1864. Pter. Sch. Hann.: Zeit. deut. geol. Ges. vol. xvi. p. 242, pl. x. fig. 12.

Char.—Zoarium of short, thick branches, with blunt ends. About ten apertures in a whorl.

Distrib.—Neocomian: Hannover.

4. **coliformis** (Michelin), 1840.

Syn. *Cricopora coliformis*, Michelin, 1840. Icon. Zooph. p. 5, pl. i. fig. 5.
,, ,, Michelin, 1845. *Ibid.* p. 212.
Entalophora colliformis, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 140.
Clavisparsa ,, d'Orbigny, 1853. Bry. Crét. p. 776.

Char.—Branches clavate; apertures small, in spiral series.

Distrib.—Albian: Grandpré, Ardennes. Cenomanian: Le Mans.

5. ? **constricta** (von Hagenow), 1840.

Syn. *Ceriopora constricta*, von Hagenow, 1840. Mon. Rüg. ii.: N. Jahrb. 1840, p. 647.

Pustulopora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.

Char.—Branches thin, much constricted.

Distrib.—Senonian—Campanian: Rügen.

6. ? **dendroidea** (Keeping), 1883.

Syn. *Entalophora dendroidea*, Keeping, 1883. Neoc. Upware, p. 138, pl. vii. fig. 12.

Char.—Branches stout, dichotomous, cylindrical. Apertures small, spiral, and quincuncial; peristomes low. Rows distant. Interspaces smooth.

Distrib.—Lower Greensand: Upware.

7. **disticha**, Ubaghs, 1879. Name only.

Syn. *Spiropora disticha*, Ubaghs, 1879. Géol. Pal. Limb. p. 223.

,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 29.

Distrib.—Senonian—Maastrichtian: Maastricht.

8. ? **echinata** (von Hagenow), 1840.

Syn. *Ceriopora? echinata*, von Hagenow, 1840. Mon. Rüg. ii.: N. Jahrb. 1840, p. 647.

Cricopora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 238.

,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 30.

Char.—Apertures in whorls of 6–8; rather crowded.

Distrib.—Senonian—Campanian: Rügen.

9. **neocomiensis** (d'Orbigny), 1853. Name only.

Syn. *Laterotubigera neocomiensis*, d'Orbigny, 1853. Bry. Crét. p. 715.

Distrib.—Neocomian: Sainte-Croix.

10. **subcompressa** (von Hagenow), 1839.

Syn. *Ceriopora subcompressa*, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 284.

,, ,, von Hagenow, 1846. In Geinitz, Grundr. vol. ii. p. 598, pl. xxiii. *b*, fig. 15.

Idmonea ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 25.

Char.—Branches laterally compressed. Apertures in spiral series; about twenty in a complete circuit of the stem; series close.

Distrib.—Senonian—Campanian: Rügen.

11. truncata (Woodward), 1833.

Syn. *Millepora truncata*, S. Woodward, 1833. Geol. Norf. p. 46, pl. iv. figs. 14*a–c*.

Char.—Indeterminable.

Distrib.—Upper Chalk: Norwich.

12. ? vertebralis (Stoliczka), 1864.

Syn. *Spiroporina*	*vertebralis*,	Stoliczka, 1864. Bry. Orakei: Nov. Exped. Geol. Th. vol. i. pt. 2, p. 106, pl. xvii. figs. 6, 7.
Spiropora	,,	Pergens & Meunier, 1867. Bry. gar. Faxe: Ann. Soc. roy. mal. Belg. vol. xxi. p. 210, pl. xi. fig. 2.
Sparsiporina	,,	Stoliczka, 1864. *Op. cit.* p. 91.

Char.—Zoœcia broad, with contracted prominent aperture. Apertures laterally well separated. Verticels well spaced.

Distrib.—Danian: Stevn's Klint, Denmark; Annetorp, Sweden.

Aff.—This species is recorded among the *Spiroporæ*, in deference to the opinion of Pergens & Meunier, who, after having examined Stoliczka's type, accepted it as *Spiropora*. According to Macgillivray,[1] however, the species is a verticillate variety of *Porina gracilis*.

PERIPORA, d'Orbigny, 1850.

[Prod. Pal. vol. ii. p. 266.]

Synonyms.

Zonopora, pars, d'Orbigny (1850, etc.).
Pustulopora, pars, Michelin (1845).

Diagnosis.

Entalophoridæ with tufted zoarium of cylindrical branches rising from a discoid base.

Zoœcia opening in spirals or whorls, with two or more series of apertures in each whorl.

Type Species.

Peripora ligeriensis, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 266. Based on figures in Bry. Crét. pl. 616, figs. 9–11, which is distinct from the *P. ligeriensis* subsequently defined, and a synonym of *P. pseudospiralis*, which is therefore the type of the genus.

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[1] P. H. Macgillivray. Mon. Tert. Polyz. Vict.: Trans. Roy. Soc. Vict. vol. iv. 1895, p. 103.

AFFINITIES.

The multiserial apertures distinguish this genus from such genera as *Spiropora*, in which the zoœcia open in single series.

Peripora pseudospiralis (Michelin), 1845.

SYNONYMY.

Pustulipora	*pseudospiralis*,	Michelin, 1845. Icon. Zooph. p. 212, pl. liii. fig. 6.
Zonopora	,,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 177.
Peripora	,,	d'Orbigny, 1851–3. Bry. Crét. p. 703, pl. 616, figs. 6–8.
,,	,,	Pergens, 1890. Revision, p. 366.
,,	,,	*pars*, Canu, 1898. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xx. p. 746.
Spiropora	*glomerata*,	d'Orbigny, 1850. Nouv. Bry. crét. : Rev. Mag. Zool. ser. 2, vol. ii. p. 109.
,,	,,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
Peripora	*ligeriensis*,	d'Orbigny, 1850. *Ibid.* vol. ii. p. 266.
,,	,,	d'Orbigny, 1851. Bry. Crét. pl. 616, figs. 9–11.
,,	,,	*pars*, d'Orbigny, 1853. *Ibid.* p. 704, pl. 745, figs. 11–13.
,,	,,	von Reuss, 1872–3. Bry. unt. Quad. : Palæontogr. vol. xx. pt. 1, p. 119, pl. xxix. fig. 10.
Escharites	*distans*,	*pars*, von Hagenow, 1851. Bry. Maastr. Kr. p. 56, pl. i. figs. 16*a–e*, *g*, *k*, *m* ; *non* figs. 16*f*, *h*, *i*, *l*, and fig. 17.
,,	,,	*pars*, Pergens & Meunier, 1887. Bry. gar. Faxe : Ann. Soc. roy. mal. Belg. vol. xxi., Mém. p. 206.

DIAGNOSIS.

Zoarium of thin, cylindrical, dichotomous branches.

Apertures in spiral or verticillate rows of from two to four, usually three. The apertures are placed in a regular quincunx, or irregularly in the lower thick parts of the branches.

Internodes shorter than the zones in the distal parts of the zoarium, but may be longer below.

DISTRIBUTION.

? Danian: Faxoe.
Senonian—Maastrichtian: Meudon; Petit Lanaye.
Santonian: Pons, Perignac, etc., Charente-Inférieure.

Coniacian: South of Les Roches, Villedieu, and Vendôme, Loir-et-Cher, in Craie de Villedieu; Tours, Indre-et-Loire.
Cenomanian: Le Mans and St. Calais, Sarthe; Lower Quader, Saxony.

AFFINITIES.

The main question in regard to this species is the relationship of the two specimens figured by d'Orbigny as *Peripora ligeriensis*. The first specimen was figured in 1851, and upon it the genus had been founded in 1850. That specimen came from the Cenomanian, and is clearly a thin branch of *P. pseudospiralis*, having spiral apertures in a double series. In 1853 d'Orbigny figured a Senonian specimen with the apertures verticillate, arranged very irregularly and not quincuncially, and with the zones separated by wide internodes. The peristomes were shown to be much higher than in *P. pseudospiralis*; but that character, according to M. Pergens, was exaggerated by d'Orbigny, whereas M. Canu tells us that the figure "n'est pas si idéale que le dit Pergens." The other features, at any rate, may justify distinction. The Museum collection includes a Senonian specimen, which is a typical *P. pseudospiralis*, so that the *ligeriensis* and *pseudospiralis* forms are not characteristic of distinct horizons.

D'Orbigny also included in his *P. ligeriensis* the very distinct *Escharites distans*, Hag.

The *Escharites distans*, Hag., seems to me to cover two species, a Maastrichtian variety of *Peripora pseudospiralis* with long interzones, and an Eleid species of very different characters. That the length of the interzones is not a constant feature in the Maastrichtian variety is shown by a specimen (**D. 3748**) in the Museum collection, in which the internodes are no longer than in the Cenomanian specimens. A species is recorded by Pergens and Meunier from Faxoe as *Escharites distans*; but as they describe the internodes as sometimes suppressed, it may be the Eleid species.

LIST OF SPECIMENS.

D. 3748. A branched fragment (on slide). Maastrichter Kreide. - Petit Lanaye. Gamble Coll.

D. 4834. A specimen with regular quincuncial apertures and narrow interzonal areas (on slide). Senonian: Coniacian. South of Les Roches. Purchased 1898.

D. 3703. A free branch. Cenomanian. Le Mans. Tesson Coll.
D. 3701. Several branches. Cenomanian. Le Mans. Tesson Coll.
D. 7091. A much branched zoarium. Cenomanian. Le Mans. Tesson Coll.

UNREPRESENTED SPECIES.

? **gradata,** d'Orbigny, 1853.

Syn. *Peripora gradata,* d'Orbigny, 1853. Bry. Crét. p. 704, pl. 745, figs. 9, 10.
,, ,, Pergens, 1890. Revision, p. 366.

Char.—Zoarium of three infundibular segments. Apertures in triserial zones round the rims of the segments.

Distrib.—Cenomanian : Villers, Calvados.

Aff.—The zoarium resembles three superimposed *Clypeinæ.*

RHIPIDOPORA, Marsson, 1887.

[Bry. Rüg. : Pal. Abh. vol. iv. p. 21.]

Characters.

Entalophoridæ? with a cylindrical stem, terminating above in a lamellar expansion which has no apertures.

Affinities.

The relations of this genus are doubtful. It may represent a variation from an Entalophorid, in which the stem expands above into a vertical lamina, just as in *Entalophora anomalissima* it expands into a horizontal disc. The genus is not represented in the Museum collection.

flabellum, Marsson, 1887.

Rhipidopora flabellum, Marsson, 1887. Bry. Rüg. : Pal. Abh. vol. iv. p. 22, pl. i. fig. 8.

Distrib.—Senonian—Campanian : Rügen.

CLINOPORA, Marsson, 1881.

[Bry. Rüg. : Pal. Abh. vol. iv. p. 24.]

Diagnosis.

Entalophoridæ with cylindrical or slightly compressed stems. The apertures open irregularly all round the stem. The zoœcia are very long, and taper gradually. The surface of the stem is ornamented by longitudinal furrows.

TYPE SPECIES.

Entalophora lineata, Beissel, 1865. Campanian: Aachen.

AFFINITIES.

This genus is closely allied to *Entalophora.* It differs therefrom by the longitudinal striations, most of which occur along the interzoœcial furrows. The separation of this group of species is convenient; but that it is not very distant from *Entalophora* may be judged by the fact that Hamm regarded the type species as a synonym of *Entalophora virgula.* By the furrowed surface of the zoarium it is nearly allied to *Siphoniotyphlus.*

1. **Clinopora lineata** (Beissel), 1865.

SYNONYMY.

Entalophora lineata, Beissel, 1865. Bry. Aach.: Nat. Verh. holl. maat. Wet. ser. 2, vol. xxii. p. 80, pl. ix. figs. 116–119.
,, ,, Stoliczka, 1872. Pal. Ind.: Cret. Fauna S. Ind. vol. iv. pt. 2, p. 31, pl. iii. figs. 9, 10.
non ,, ,, Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 133.
Clinopora ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 24, pl. ii. fig. 3.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 309.

DIAGNOSIS.

Zoarium of long, thin, cylindrical branches. The surface is marked by regular, well-developed, longitudinal lines, which are parallel and do not anastomose.

Zoœcia few in a branch.

Apertures irregularly arranged; distant. Peristomes usually low, but occasionally of considerable length.

DIMENSIONS.

	B.M., D. 660.
Diameter of branch	·4 mm.
Diameter of zoœcia	·15 ,,
Diameter of aperture	·08 ,,

DISTRIBUTION.

BRITISH:
Upper Chalk: Kent.
Middle Chalk: Chatham.

FOREIGN:
Senonian—Campanian: Friedrichberg; Preusberg; Vaels; Rügen.
Turonian: Yermanoor, S. India, in Arrialoor Group.

FIGURE.

Pl. XII. Fig. 1. A branch of the cylindrical form, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 660.**

LIST OF SPECIMENS.

BRITISH.

D. 660. A thin branch (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Clinopora* (*Entalophora*) *lineata*, Beiss. Figd. Pl. XII. Fig. 1.

D. 3126. A long branch (on slide). Upper Chalk. Kent. J. Simmons Coll.

D. 417. Three fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

D. 942. Two fragments, one with high peristomes (on slide). Mucronatenkreide. Rügen. Vine Coll.

2. **Clinopora costulata,** Marsson, 1887.

SYNONYMY.

Clinopora costulata, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 24, pl. ii. fig. 2.

non ,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 309.

Entalophora lineata (*non* Beiss.), von Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 133, pl. xxv. figs. 5, 6.

? *Heteropora kirsteni*, von Reuss, 1874. *Ibid.* p. 136, pl. xxv. fig. 10.

DIAGNOSIS.

Allied to *Clinopora lineata* (Beiss.), but having anastomosing instead of parallel lines.

DISTRIBUTION.

Senonian—Campanian: Rügen.
Turonian: Strehlen and Weinböhlen, in Upper Pläner.

SPECIMENS.

D. 945. Two branches (on slide). Mucronatenkreide. Rügen. Vine Coll.

? **D. 661.** A branch recorded by Vine as *Clinopora costulata*. Middle Chalk. Chatham. Vine Coll. Generic affinities doubtful.

3. **Clinopora striatopora** (Vine), 1885.

SYNONYMY.

Entalophora striatopora, Vine, 1885. Cambr. Greensd.: Proc. Yorks. Geol. Soc. vol. ix. p. 15, pl. i. fig. 5.

,, *lineata*, var. *striatopora*, Vine, 1889. Polyz. Greensd.: *ibid.* vol. xi. p. 261.

Entalophora lineata, var. *striatopora*, Vine, 1892. Notes Up. Ch. Bry.: Rep. Brit. Assoc. 1891, p. 658.

" " " Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 331.

DIAGNOSIS.

Zoarium of cylindrical branches with numerous irregularly arranged apertures. The peristomes are very high and sharply reflexed; they are, for this genus, not very distant. The lines on the surface anastomose occasionally.

DIMENSIONS.

	B.M., D. 1875.
Diameter of branch	·7–1 mm.
Diameter of zoœcia	·35 "
Diameter of aperture	·17 "

DISTRIBUTION.

Upper Greensand: Cambridge.

AFFINITIES.

Worn fragments of this species appear similar to *C. lineata*, but well-preserved specimens show the highly raised peristomes, the anastomosing lines, and the less distant apertures, which are the characteristics of this species.

LIST OF SPECIMENS.

D. 1875. The type and three other specimens (on slide). Upper Greensand. Cambridge. Figd. Vine, 1885. Jesson Coll.

B. 4447. Two worn fragments on slide with *Entalophora virgula*. Upper Greensand. Cambridge. Vine Coll.

4. Clinopora spinigera, nov.

[*Spiniger*, 'bearing thorns.']

DIAGNOSIS.

Zoarium of short, thick, erect branches, which appear thorny owing to the prominence of the highly raised peristomes, which project almost at right angles to the main axis. Surface of zoarium ornamented by strong longitudinal lines.

Apertures distant, irregular, equally on all sides of the stem.

DIMENSIONS.

	B.M., D. 2821.
Diameter of branch	·25–·8 mm.
Diameter of zoœcia	·1–·17 ,,
Diameter of aperture	·08 ,,

DISTRIBUTION.

Chalk Detritus: Charing, Kent.

FIGURES.

Pl. XII. Fig. 3. A zoarium, × 12 dia. Chalk Detritus: Charing. T. R. Jones Coll. **D. 2821.**

Pl. XII. Fig. 4. A thin, longitudinal section, × 10 dia. Charing. T. R. Jones Coll. **D. 4940.**

AFFINITIES.

This species agrees with *C. striatopora* (Vine) in the height of the peristomes, but the zoœcia and zoarium are smaller, and the apertures more distant. The peristomes, moreover, are less sharply reflexed. It may be regarded as a thin, deep-sea representative of *C. striatopora.*

LIST OF SPECIMENS.

D. 2821. Thirteen fragments (on slide). Chalk Detritus. Charing, Kent. T. R. Jones Coll. Figd. Pl. XII. Fig. 3.

D. 2822. Five fragments (on slide). Chalk Detritus. Charing. T. R. Jones Coll.

D. 4588. Four fragments (on slide). "Chalk Marl" (? Detritus). Charing. P. E. Ewen Coll.

D. 4940. A thin, longitudinal section. Chalk Detritus. Charing. T. R. Jones Coll. Figd. Pl. XII. Fig. 4.

SIPHONIOTYPHLUS, Lonsdale, 1850.

[Dixon, Geol. Sussex, p. 300.]

SYNONYMS.

Lanceopora, von Reuss, 1872.
Epidictyon, Marsson, 1887.

DIAGNOSIS.

Zoarium of erect, ribbon-shaped, compressed branches, which occasionally divide dichotomously. The lateral margin may be continued as a thin selvage. Surface marked with fine longitudinal lines. Apertures in alternate, outwardly curved series, so that the general diagram of the apertures is pinnate.

TYPE SPECIES.

Siphoniotyphlus plumatus, Lonsdale, 1850. Dixon, Geol. Suss. p. 300, pl. xviii. B, figs. 2, 2*a*. Chalk: Sussex.

AFFINITIES.

Siphoniotyphlus differs from *Clinopora* by having flattened branches on which the apertures are pinnately or sub-pinnately arranged. The near affinity of the two genera is shown by the specimen **D. 4324**, which is in its lower part a typical *Siphoniotyphlus*, but in the upper part this arrangement is imperfectly developed. The genus resembles *Porina* in the pinnate arrangement of the apertures and the shape of the zoarium, but *Porina*, though founded as a Cyclostomatous genus, is one of the Cheilostomata.

1. Siphoniotyphlus plumatus, Lonsdale, 1850.

SYNONYMY.

Siphoniotyphlus plumatus, Lonsdale, 1850. In Dixon, Geol. Suss. p. 300, pl. xviii. B, figs. 2, 2*a*.
Epidictyon ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 336.
,, *tenue*, *pars*, Vine, 1893. *Ibid.* pp. 323, 336.

DIAGNOSIS.

Zoarium of long, thin, unbranched stems, with a sharp lateral selvage. Surface ornamented by lines parallel to the series of apertures.

Apertures in curved series of from three to five. The series are crowded.

The distal end of the stem may become narrower, thicker, without selvage, and may have irregularly arranged apertures.

DISTRIBUTION.

Upper Chalk: Salisbury; Sussex. Zone of *Belemnitella mucronata*, Clarendon.
Middle Chalk: Chatham.

FIGURES.

Pl. XII. Fig. 6*a*. Part of longitudinal section, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 703.**

Pl. XII. Fig. 6*b*. Upper part of a zoarium, of which the lower part has regularly pinnate apertures and a thin selvage, × 10 dia. Upper Chalk: Zone of *Belemnitella mucronata*. Clarendon, near Salisbury. Gamble Coll. **D. 4324.**

LIST OF SPECIMENS.

D. 2944. The type-specimen; and part of it and its impression on another block of chalk. Upper Chalk. Sussex. Dixon Coll. Figd. by Lonsdale, in Dixon, Geol. Suss. pl. xviii. A, figs. 2, 2*a*.

D. 4324. A zoarium in which the lower part is of the normal *plumatus* type. The upper part corresponds to the form of von Hagenow, having no selvage, rounded lateral edges, and irregularly arranged apertures. Upper Chalk: Zone of *Belemnitella mucronata*. Clarendon, near Salisbury. Gamble Coll. Figd. Pl. XII. Fig. 6*b*.

D. 703. A thin section through a young zoarium. Middle Chalk. Chatham. Vine Coll., No. 99. Recorded by Vine as *Epidictyon plumatus*: Rep. Brit. Assoc. 1892, p. 336. Figd. Pl. XII. Fig. 6*a*.

D. 702. A part of a small zoarium (probably the same as **D. 703**), on slide. Upper Chalk. Chatham. Vine Coll. Recorded by Vine as *Epidictyon tenue*.

D. 2654. A fragment of a zoarium (on slide). Upper Chalk. Salisbury. Vine Coll. Recorded as *Epidictyon tenue* by Vine, 1893: Rep. Brit. Assoc. 1892, p. 323.

2. **Siphoniotyphlus tenuis** (von Hagenow), 1840.

SYNONYMY.

Eschara tenuis, von Hagenow, 1840. Mon. Rüg., Nacht.: Neu. Jahrb. 1840, p. 645.
Epidictyon tenue, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 17, pl. i. fig. 4.
,, ,, Vine, 1892. Notes Up. Ch. Bry.: Rep. Brit. Assoc. 1891, p. 658.
Lanceopora striolata, von Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 130, pl. xxiv. figs. 17, 18.

DIAGNOSIS.

Zoarium with the lowest part of the stem cylindrical or subcylindrical; the main portion of the stem is broad and flat, without lateral selvage.

Zoœcia somewhat irregularly arranged; apertures distant; the pinnate arrangement is barely recognizable.

DIMENSIONS.

	D. 2741.		D. 2829.
Width of branch	·8 mm.	...	about 2 mm.
Diameter of zoœcia ...	·12–·18 ,,	...	·12–·2 ,,
Diameter of aperture ...	·08–·12 ,,	...	·08–·12 ,,

DISTRIBUTION.

ENGLAND:

Middle Chalk: Chatham.
Chalk Detritus: Charing, Kent.
? Upper Greensand: Cambridge (*fide* Vine).

FOREIGN:

Senonian—Campanian: Rügen.
Turonian: Strehlen, in Upper Pläner.

FIGURES.

Pl. XII. Fig. 2. A narrow zoarium, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 2741.**

Pl. XII. Fig. 5. A fragment of a wider zoarium, × 10 dia. Chalk Detritus: Charing. T. R. Jones Coll. **D. 2829.**

AFFINITIES.

This species differs from *S. plumatus* by the less regular arrangement of the apertures and the absence of the selvage.

LIST OF SPECIMENS.

D. 2829. A fragment of a zoarium (on slide). Chalk Detritus. Charing, Kent. T. R. Jones Coll. Figd. Pl. XII. Fig. 5.

D. 4478. A smaller fragment (on slide). Chalk Detritus. Charing. T. R. Jones Coll.

D. 2741. A narrow specimen (on slide). Middle Chalk. Chatham. Vine Coll. Figd. Pl. XII. Fig. 2.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **johnstrupi** (Pergens & Meunier), 1887.

SYN. *Bisidmonea johnstrupi*, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. roy. mal. Belge, vol. xxi., Mém. p. 219, pl. xii.

CHAR.—Of thick branches, sometimes ending above in a cylindrical branch. Apertures in pinnate rows of from three to nine. Superficial striations not apparent.

DISTRIB.—Danian: Faxoe.

2. **variolaria** (Leymerie), 1851.

Syn. *Pustulopora variolaria*, Leymerie, 1851. Nouv. type Pyrén.: Mém. Soc. géol. France, ser. 2, vol. iv. p. 192, pl. ix. fig. 7.

Char.—Zoarium with irregular series of tubercles in the middle area. Apertures in lateral pinnate series of from four to five.

Distrib.—Senonian—Maastrichtian: Bois de la Barade, near Gensac, Haute-Garonne.

CLYPEINA, Michelin, 1844.

[Icon. Zooph. p. 177.]

Diagnosis.

Zoarium infundibuliform, fixed by a discoid base. Stem long and gradually expanding, marked by longitudinal depressions along the sutures. Upper surface a conical depression.

Apertures along the upper margin; uniserial or biserial, small.

Type Species.

Clypeina marginiporella, Michelin, 1844. Icon. Zooph. p. 177, pl. xlvi. fig. 27. Eocene: Morigny, near Étampes, Seine-et-Oise.

Remarks.

This genus, by its cupuliform zoarium, resembles *Discosparsa* in the Diastoporidan series, but it differs from that genus by having the apertures limited to a single or double series round the rim. The upper surface (Fig. 28*b*) is bare of apertures. The genus has resemblance to the Theonoidæ, but that appears, however, superficial. Its real affinities appear to be with the Entalophoridæ. It may be regarded as a small ally of *Entalophora anomalissima*, with which it agrees in having a solid stem and distal cupuliform expansion; in *E. anomalissima* the apertures are very irregularly distributed on the stem, and in the disc tend to crowd round the margin. *Clypeina* may have developed by continued variation in these directions. The genus is rare, so that the Museum has insufficient material for any to be spared for microscopic sections. And it is quite possible that this genus, *Corymbopora*, and *Umbrellina* may be only the larval stages of other Bryozoa.

Clypeina tubæformis, Lonsdale, 1850.

SYNONYMY.

Clypeina tubæformis, Lonsdale, 1850. In Dixon, Geol. Suss. p. 274, pl. xviii. A, fig. 4.

DIAGNOSIS.

Zoarium with a long, narrow, gradually expanding stem, and a deep upper conical depression.

Apertures biserial.

DIMENSIONS.

	D. 2943.
Height of zoarium	7·5 mm.
Diameter of disc	3·5 ,,

DISTRIBUTION.

Upper Chalk: Dover.

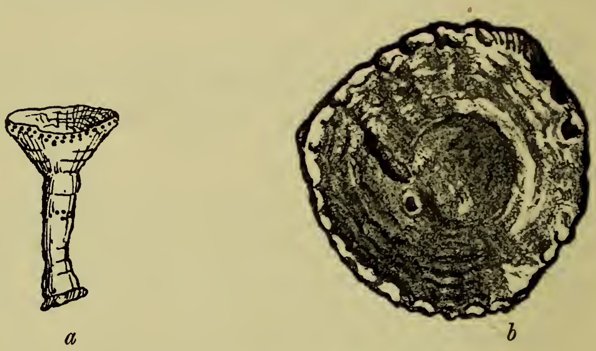

FIG. 28.—*Clypeina tubæformis,* Lonsd.

FIGURES.

Fig. 28*a*. The type-specimen, × about 3 dia. Chalk: Dover. Bowerbank Coll.

Fig. 28*b*. The upper surface of the same specimen, × 10 dia. **D. 2943.**

D. 2943. The type-specimen. Upper Chalk. Dover. Bowerbank Coll. Figd. by Lonsdale: *op. cit.* pl. xviii. A, fig. 4, and Figs. 28*a* and *b*.

UMBRELLINA, von Reuss, 1872.

[Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 119.]

Diagnosis.

Zoarium small; it consists of a narrow stem ending in a flat-topped expansion. Zoœcia open only on the upper surface, over the whole of which they are irregularly scattered. Apertures large.

Type Species.

Umbrellina stelzneri, von Reuss, 1872. *Op. cit.* p. 119, pl. xxix. fig. 11. Cenomanian: Plauen, Saxony.

Affinities.

This genus, of which only one species is known, and which is unrepresented in the Museum collection, is allied to *Clypeina* by the general shape of the zoarium and by the absence of apertures from the stem; but the top is not hollow; the apertures are larger and not confined to the rim.

Vine's[1] *Umbrellina paucipora* is a larval fasciculate Bryozoan.

HAMMIA, nov. nom.

Synonyms.

Stigmatopora, Hamm, 1881, *non* Kaup, 1853.
Ceriopora, *pars*, Goldfuss, 1827, etc.
Pustulopora, *pars*, de Blainville, 1830, etc.
Entalophora, *pars*, d'Orbigny, 1850, etc.

Diagnosis.

Entalophoridæ with thick branches composed of numerous zoœcia. The surface is marked by a spiral ridge, sometimes broken into two alternate lateral ridges. A single series of apertures occurs on the ridge.

Apertures crowded, quincuncial; distributed over the whole surface.

Type Species.

Ceriopora pustulosa, Goldfuss, 1827. Senonian: Maastricht.

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[1] G. R. Vine. Polyz. Low. Greensd.: Proc. Yorks. Geol. Soc. vol. xi. 1889, p. 270.

AFFINITIES.

This name is proposed instead of *Stigmatopora*, which is preoccupied for a Lophobranch fish.[1] The genus was well described by Hamm, who referred to its spirally ridged zoarium, which is its main difference from *Entalophora*. Goldfuss' figure did not show this structure, and accordingly d'Orbigny gave the specific name to specimens now included in *Entalophora madreporacea*.

Hamm used this genus as the type of a group, the Stigmatoporina, characterized by the axial bundle of fine proximal portions of the zoœcia. Marsson[2] has remarked the artificial nature of the group of Bryozoa associated on this character.

The type species has some zoarial resemblance to *Sparsicavea undulata*, but Marsson states the absence of 'Nebenzellen' as one of the characters of his group, the Stigmatoporina; and no cancelli are shown in the longitudinal section of *H. pustulosa* figured on p. 283.

Hammia pustulosa (Goldfuss), 1827.

SYNONYMY.

Ceriopora	*pustulosa,*	Goldfuss, 1827. Petref. Germ. vol. i. p. 37, pl. xi. fig. 3.
,,	,,	Morren, 1829. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 41.
non ,,	,,	Michelin, 1845. Icon. Zooph. p. 211, pl. liii. fig. 4.
Pustulopora	,,	de Blainville, 1830. Zooph.: Dict. Sci. Nat. vol. lx. p. 383.
,,	,,	de Blainville, 1834. Man. Act. p. 418.
,,	,,	M. Edwards, 1836. In Lamarck, Hist. Nat., 2nd ed., vol. ii. p. 314.
,,	,,	von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
non ,,	,,	Lonsdale, 1850. In Dixon, Geol. Suss. p. 288.
,,	,,	von Hagenow, 1851. Bry. Maastr. Kr. p. 18, pl. i. fig. 7.
? ,,	,,	Kade, 1852. Los. Verst. Schanzenb. p. 31.
non ,,	,,	d'Orbigny, 1853–4. Bry. Crét. p. 795, pl. 755, figs. 1–3.
Entalophora	,,	Staring, 1860. Bod. Nederl. vol. ii. p. 402.
,,	,,	Brauns, 1875. Sen. Salzb.: Zeit. Ges. Naturw. vol. xlvi. p. 401.
,,	,,	Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 205.

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[1] F. Kaup. Uebersicht der Lophobranchier: Arch. Naturges. vol. xix. 1853, p. 233.

[2] Marsson. Bry. Rüg.: Pal. Abh. vol. iv. p. 7.

Entalophora pustulosa, pars, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
Stigmatopora ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 46.
Pustulopora goldfussi, Römer, 1840. Verst. nordd. Kr. p. 22.

DIAGNOSIS.

Zoarium of stout, cylindrical branches, which divide dichotomously. The surface of the branches are marked by faint, oblique or spiral, blunt ridges.

Zoœcia crowded; the peristomes are low. Apertures quincuncial, in curved lines.

DIMENSIONS.

Diameter of branch	2–2·5 mm.
Diameter of zoœcia	·2 ,,
Diameter of aperture	·15 ,,

DISTRIBUTION.

Senonian—Maastrichtian : Maastricht.
Campanian : Gehrden, Hannover.
Santonian : Salzberg, near Quedlinburg.

FIGURE.

No. 29. A longitudinal section, × 7 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 3569.**

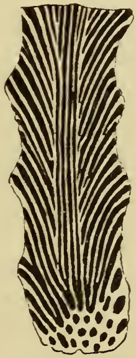

FIG. 29.—*Hammia pustulosa* (Goldf.).

AFFINITIES.

This species has a certain zoarial resemblance to *Sparsicavea undulata* (Hag.), from which it differs by the absence of cancelli.

The structure of the zoarium is illustrated by the longitudinal section shown on Fig. 29, in which, however, the separation of the axial bundle is too sharply marked.

LIST OF SPECIMENS.

D. 3477. Two fragments (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3529. Three fragments (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3532. Two fragments with clasping bases (on slide). Maastrichter Kreide. Maastrichter. Van Breda Coll.

D. 3535. Two fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3537. Twenty fragments (in tube) and one slide containing a longitudinal section. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3538. Eleven fragments (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3561. Two fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3562. Two fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3563. Two fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3569. Fifty fragments and two slides with longitudinal and transverse sections. Maastrichter Kreide. Maastricht. Van Breda Coll. Figd. No. 29, p. 283.

D. 3573. A branched worn fragment (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3778. A small worn fragment (on slide). Maastrichter Kreide. Maastricht. Gamble Coll.

D. 3559. The basal part of a zoarium. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 1380. Two fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3331. A branched fragment (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3493. Two fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3531. A thick branched fragment (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3533. A branch (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3534. Three fragments (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6447. Two branched fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

Family ELEIDÆ.

Synonyms.

Salpingina, von Hagenow, 1851.
Eleidæ, d'Orbigny, 1853; Marsson, 1887.
Ceidæ, d'Orbigny, 1854.
Diastoporidea, pars, Novak, 1877.
Entalophoridea, pars, Novak, 1877.
Entalophoridæ, pars, von Zittel, 1880.
Stigmatoporina, pars, Hamm, 1881.
Ceina, Pergens, 1890.
Melicertitidæ, Pergens, 1890.

Diagnosis.

Cyclostomata Tubulata in which the apertures are lateral and subterminal, and which frequently have avicularia and spines. The marsupial chambers are gonocysts or gonœcia. Many of the zoœcia may be closed by thin, calcareous films.

The Synonyms of the Eleidæ.

The group of Eleidæ was founded by d'Orbigny[1] in 1853 as a family of his order, the 'Centrifuginés,' characterized by the possession of very long, capillary, oblique, centrifugal tubes. The order, therefore, corresponds with Busk's Cyclostomata. Two years before the foundation of d'Orbigny's family, von Hagenow had established a special subdivision of Bryozoa, the Salpingina, for the only two Eleid genera, *Escharites* and *Inversaria*, which he accepted. The characters assigned to the Salpingina were long tubular zoœcia with trumpet-shaped distal expansions, closure by a calcareous or chitinous membrane which is perforated by an aperture, and probably always the presence of an operculum (*Klappe*).

Hamm, in 1881, founded a 'typus Stigmatoporina,' as a section of the Cyclostomata Inarticulata, for those genera with a central axial bundle of long, parallel, cylindrical zoœcia surrounded by one or more zones of lateral 'Zellen.' He included in this group *Cyrtopora*, *Stigmatopora* (i.e. *Hammia*), and *Melicertites*, but this is an artificial association. It is based on an imperfect appreciation of the principle on which von Hagenow's Salpingina had been founded thirty years before; for the 'Zellen' of the external layer in *Meliceritites* are only the expanded end of the zoœcia which form the central bundle. And in neither *Hammia* nor *Cyrtopora* (see Figs. 29 and 30) is there any such expanded distal end or external zone of cells round an axial bundle of tubes.

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[1] Bry. Crét. p. 585.

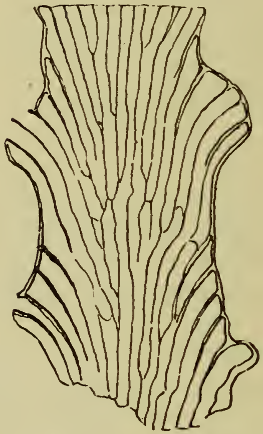

Fig. 30.—*Cyrtopora elegans*, Hag. A longitudinal section, × 14 dia. Maastrichter Kreide. Maastricht. Van Breda Coll. **D. 3326.**

Marsson, in 1888, divided the Cyclostomata into two 'typi,' the Solenoporina, including all except the Ceidæ and Eleidæ, for which he founded the 'typus' Metopoporina, which he defined as follows:—"Zellröhren aus enger Basis nach vorn zu sehr erweitert, oft fast trompetenartig, mit einer rhombisch-sechseckigen Stirnwand an die Oberfläche tretrend. Mündung klein, nur einen Theil der Stirnwand einnehmend."

Pergens, in 1890, abolished the Metopoporina, by separating it into two groups, the Ceina for the Ceidæ, and the Melicertitina for what is practically the same as the Eleidæ. According to Pergens, in the Melicertitina the zoœcia are trumpet-shaped; the aperture occupies only a part of the external surface of the zoœcia; and the 'ovicells' are interior, opening by a triangular, elongated aperture.

Of these successively proposed groups the Salpingina and Stigmatoporina are impracticable, as they include only the cylindrical, and exclude the adnate forms. The Melicertitina of Pergens is unsatisfactory, as the diagnosis states that there are no external 'ovicells,' and the structures which, as we shall see, are no doubt avicularia, were described as ovicells. There seems no reason why d'Orbigny's well-founded family, the Eleidæ, should be displaced by either of the groups subsequently proposed.

Eleid Characters and Cyclostomatous Avicularia.

In the various diagnoses of Busk's orders, the Cheilostomata and Cyclostomata, stress is usually laid on two characters:[1] (1) that in the Cheilostomata the apertures are subterminal, operculate, and rarely circular, whereas in the Cyclostomata the apertures are terminal, inoperculate, and usually circular; (2) that in the Cyclostomata there are no avicularia or vibracula.

The Cretaceous family, the Eleidæ, is important, as it breaks down the distinction between the Cheilostomata and Cyclostomata, based on these characters. D'Orbigny founded this family in 1853 for a series of Bryozoa with anomalous characters, of which the most striking was the presence of a series of modified zoœcia that he described as 'cellules accessoires.' These accessory structures are of two types, large superficial marsupial chambers, and cells with triangular or elongated apertures and a platform parallel to the surface of the zoarium. The marsupial chambers were described by d'Orbigny as 'cellules ovariennes,' and they are clearly gonocysts or gonœcia. The nature of the second set is more important. D'Orbigny recognized that they sometimes occur on the same specimen as 'cellules ovariennes,' and therefore cannot be ovarian. He suggested that they may be male cells or sperm-cells.[2] Nevertheless, Pergens and Marsson subsequently described them as ovicells. Canu, recognizing that this view is a mistake, has proposed for these structures the name 'eleocellaires.' Waters, however, has maintained that they are avicularia, and his reasons are convincing. "The presence of a spatulate mandible," says Waters of a Cenomanian specimen which he figures, "is distinctly indicated, and there can be little doubt that we have before us a vicarious avicularium. In some cases the end of the mandible has been unsymmetrical, similar abnormalities not being unfrequent in recent vicarious avicularia. In *M. royana*, Wat., there are also avicularia scattered over the surface, and here again, if we are to judge by analogy, we can scarcely doubt that in the beak there has been a chitinous mandible."

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[1] Thus Busk's latest definition of the Cyclostomata (Rep. Chall. Exped., Zool., vol. xvii. 1886, p. 1) is "Zoœcia tubular, calcareous, partially free or wholly connate or immersed; aperture terminal, inoperculate." Hinck's diagnosis (Brit. Mar. Polyz., 1880, p. cxxxix) adds the second character: "Zoœcia tubular, with a plain, inoperculate orifice. Marsupia and appendicular organs [avicularia and vibracula, *v.* p. cxxxvi] wanting."

[2] D'Orbigny: Bry. Crét. p. 99.

But avicularia are still regarded as typical of the Cheilostomata. Waters[1] speaks of "a character so distinctly Cheilostomatous as avicularia." Harmer[2] states that "the avicularium and vibraculum . . . occur . . . in certain Cheilostomata only." Waters accordingly concludes[3] that "in the Cretaceous Melicertitidæ the characters are in the main Cheilostomatous united with some that are Cyclostomatous." In the Catalogue of the Jurassic Bryozoa (p. 157) I have referred to the *Meliceritites* figured by Römer as one of the Cheilostomata; and Waters seems disposed to assign the genus and its allies to that order rather than to the Cyclostomata. But this seems to be going too far; for the structure of the zoœcia is Cyclostomatous, as Waters admits. The resemblance to the Cheilostomata is due to the modification of some zoœcia to act as avicularia. That this is a case of parallel development, and not of homogeny, is shown by the geological history of the group.

The first stage in the development of these Cyclostomatous avicularia occurs in the genus *Haploœcia*, a Jurassic genus in which the zoœcia, though tubular, present externally a certain resemblance to those of some Cheilostomata. Thus, in *Haploœcia* the zoœcia, at their distal ends, are hexagonal, bounded by ridges, and have a small, subterminal aperture at the upper part. This arrangement is very similar to that of the genus *Cellaria*; but the characters of the zoœcia are essentially distinct. The branches of *Haploœcia* consist of a bundle of long tubular zoœcia, whereas those of *Cellaria* are made of box-like zoœcia, piled up like a brick tower.

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[1] A. W. Waters. Chil. Char. in Melicertitidæ: Ann. Mag. Nat. Hist. ser. 6, vol. viii. 1891, p. 49.

[2] S. F. Harmer. Polyzoa: Cambridge Nat. Hist. 1896, vol. ii. p. 524.

[3] A. W. Waters: *op. cit.* p. 53.

Haplocœcia differs from the normal Entalophorids only by the constriction of the aperture, which is subterminal instead of terminal in position. It has no avicularia, and its zoœcia are monomorphic.

The next stage in the evolution of the Eleidæ is represented by a Bryozoan from the Lower Greensand beds of the Isle of Wight, which was described by Lonsdale as *Chisma furcillatum.* The normal zoœcia in this species agree with those of *Haplocœcia* (*cf.* figures of Lonsdale's type on Pl. XI. Figs. 14, 15); but in addition to them there are some elongated zoœcia of a different type. The specimens are not well preserved, so the character of the zoœcia with these elongated apertures is open to some doubt. But they are probably a simple form of the type of avicularium present in *Meliceritites lonsdalei*, in which the aperture is circular or elliptical, below a depressed area bounded by the distal prolongation of the peristome. The avicularium has been formed by the development of a platform above the aperture, which is itself of the normal form. The close resemblance of *Meliceritites lonsdalei* to the Entalophoridæ is shown by the fact that the species has hitherto been included in the genus *Pustulopora.*

A more specialized form of avicularium occurs in some species such as *Meliceritites undata* (Pl. XVI. Fig. 3), in which the broad platform for the support of the mandible is notched by the upper end of the triangular or trigonal aperture.

Hence there is known a fairly complete series of stages in the development of these avicularia from normal Cyclostomatous tubular zoœcia.

The other characters usually regarded as typical of the Cheilostomata also occur in the Eleidæ; for the aperture is smaller than the diameter of the zoœcia, and is lateral or subterminal. The presence of an operculum cannot be positively asserted, but its occurrence in the Cretaceous Eleidæ is probable from evidence cited by Waters, who has described in his *Meliceritites royana* a contraction formed by a curved plate below the aperture; he remarks that "possibly an operculum has an attachment here, but of this I have not been able to satisfy myself." As the opercula are chitinous, it is not to be expected that they should be found fossil, and only indirect evidence of their presence, such as traces of their attachment, is probable.

The presence of opercula in Cyclostomata has, however, been affirmed owing to the closure of some zoœcia by a thin pellicle. Zoœcia are thus closed both in Cheilostomata and Cyclostomata; and the occurrence of these calcareous films above the position of the operculum in Cheilostomata[1] shows that they cannot be regarded as opercula. The nature of these closures is uncertain. They occur in zoœcia scattered all over the colony, and amongst open zoœcia; hence they are not due to an epithecal growth over the basal, dead zoœcia of a zoarium. It is also improbable that the closure is a seasonal protection, like the epiphragms that cover the mouths of snail shells during the winter; for Chalk Bryozoa with such closed zoœcia must have lived in a moderately deep sea, below the limit of seasonal change. Similarly closed cells, which are sometimes covered by an inverted funnel-shaped cap pierced by a pore, are known among recent Cyclostomata. Smitt suggested that such zoœcia were sperm cells, and Hincks quoted the hypothesis as plausible. Some of the Chalk Bryozoa (*e.g.* Pl. XIV. Fig. 4) have the same type of closure, consisting of a conical cap pierced by a pore.

Another possibility in regard to these closed cells is that they are zoœcia in process of regeneration by the degeneration of the polype into a 'brown body,' from which a new polypide is formed. This regeneration of zoœcia is well known among Bryozoa, and it offers the most satisfactory explanation of these closed cells.

As, then, the Eleidæ have a lateral aperture, avicularia, external gonœcia or gonocysts, and probably, in some cases, also a true operculum, the only point in which they agree with the diagnosis of the Cyclostomata given by Busk and Hincks is that the zoœcia are tubular. But this character clearly shows the Cyclostomatous origin of the Eleidæ, which appear to have developed through the *Haploœcia-Chisma* series from the Entalophoridæ.

Whether the Eleidæ became extinct in the Cretaceous, and whether they left descendants, is doubtful. It is possible that, by continued reduction of the proximal end of the zoœcium, the Eleidæ gave origin to some members of the Stolonata or Cellularina.

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[1] *E.g.* in *Porina coronata* (Rss.), Waters. N. Ital. Bry.: Quart. Journ. Geol. Soc. vol. xlvii. 1891, p. 25, pl. iv. figs. 2, 15.

THE SUBDIVISION OF THE ELEIDÆ.

As d'Orbigny recognized, we have among the Eleidæ a series of Bryozoa with very different habits. Some are adnate discs like *Berenicea*; others, erect fronds like *Diastopora*; and others, solid cylindrical shoots like *Entalophora*. But as the group is small, there is no need to subdivide it into two families corresponding to the Diastoporidæ and Entalophoridæ.

D'Orbigny based his primary division into genera with large 'cellules ovariennes' and those without. This arrangement is unsatisfactory, as has been pointed out by Pergens, who seems, however, to have unnecessarily reduced the number of genera. *Nodelea* is a convenient group if d'Orbigny's definition be emended, and the genus be retained for Eleids with erect, solid branched zoaria and without avicularia. *Meliceritites* may then be accepted for species with a similar habit, but provided with avicularia. The presence or absence of avicularia is, however, not easy to prove in fragmentary specimens, because the avicularia are often sparsely scattered. But to treat this character as of generic value is hardly to give it undue importance, since it has hitherto been regarded as of ordinal value.

THE NATURE OF THE CEIDÆ.

We have seen that in the Eleidæ the zoœcia expand distally, and contract proximally to a thin, narrow tube, generally with thick walls. If we remove from an Eleid the thin front walls, and thus expose the expanded ends of the zoœcia, there is left a specimen with the surface formed of thin raised walls which enclose hexagonal or lozenge-shaped cavities, at the bottom of each of which is a pore opening to a narrow tube. This is exactly the structure of the specimens for which d'Orbigny instituted the family Ceidæ. Take, for example, *Filicea regularis*, Orb. (Bry. Crét. pl. 786, figs. 1–4). The two sections shown by d'Orbigny are both essentially the same as in *Meliceritites*. The figure of what is represented as the external surface shows a series of hexagonal cells, each of which is continued downward as a fine tube. What is described as the aperture is the upper end of the narrow proximal portions of the zoœcia, where they open out to the distal expansion.

Hence the family of the Ceidæ must be dismembered among the genera of Eleidæ. for the Ceids represent only worn and usually indeterminable specimens, in which the front wall has been lost.

Haase[1] has suggested the Alcyonarian affinity of some at least of the Ceidæ.

REPTELEA, d'Orbigny, 1853.[2]

Synonyms.

Escharina, pars, d'Orbigny, 1850.
Diastopora, pars, d'Orbigny, 1850.
Semielea, pars, d'Orbigny, 1853 ; Pergens, 1890.

Diagnosis.

Eleidæ with the zoarium having an adnate, berenicoid habit. There are no avicularia.

Type Species.

Reptelea pulchella, d'Orbigny, 1853. Senonian and Turonian: France.

1. **Reptelea pulchella**, d'Orbigny, 1853.

Synonymy.

Reptelea pulchella, d'Orbigny, 1853. Bry. Crét. p. 642, pl. 738, figs. 16, 17.
Semielea plana, d'Orbigny, 1853. Bry. Crét. p. 638, pl. 738, figs. 12–14.
,, ,, *pars*, Pergens, 1890. Revision, p. 393.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 210.
,, ,, *pars*, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 750, pl. xxii. fig. 6.

Diagnosis.

Zoarium thin, irregular, undulating.

Apertures triangular, and surrounded by a well-marked peristome; they are arranged quincuncially.

Zoœcia hexagonal in shape externally. The front wall is tumid or depressed; in the latter case (var. *plana*) the zoœcia are separated by ridges. Zoœcia sometimes closed by a tubular cap.

Gonocysts small, occupying the space of about six zoœcia.

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[1] C. Haase. Foss. Alcyon.: N. Jahrb. 1890, vol. ii. p. 60.

[2] Bry. Crét. p. 642.

DIMENSIONS.

	Fide Pergens.
Diameter of zoœcia	·24–·28 mm.
Transverse diameter of aperture ...	·16–·18 ,,

DISTRIBUTION.

Senonian — Santonian : Saintes and Pons, Charente - Inférieure ; ? St. Mathurin, Maine-et-Loire.
Coniacian : Tours, Ste. Paterne, Luynes, and Joué, Indre-et-Loire, in Craie de Villedieu.
Turonian or Coniacian : Lisle, Vendôme, Les Roches, etc., Loir-et-Cher.
Turonian : Chinon, in Craie marneuse ; St. Germain, near Flèche, Sarthe ; Montoire, Loir-et-Cher.
Cenomanian : St. Calais, Sarthe ; Cap de la Hève, Seine-Inférieure.

FIGURE.

No. 31. Part of a zoarium of var. *plana*, with a gonocyst ; × 17 dia. Cenomanian : Cap de la Hève. Presented by Wm. Hill, Esq. **D. 4387.**

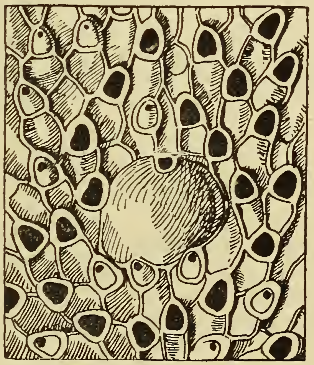

FIG. 31.—*Reptelea pulchella*, Orb., var. *plana*.

LIST OF SPECIMENS.

D. 4686. Three fragments of var. *plana* (on slide). Craie marneuse. Chinon. Purchased 1898.

D. 4819. A fragment of a zoarium (on slide). Senonian. St. Mathurin, Maine-et-Loire. Purchased 1898.

D. 4826. A zoarium encrusting a branch of *Meliceritites*, sp. (on slide). Turonian : Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4387. A large, irregular zoarium, var. *plana*, with gonocyst. Cenomanian : Craie chloritée. Cap de la Hève. Presented by Wm. Hill, Esq. Figd. No. 31.

2. Reptelea (?) parasitica (von Hagenow), 1839.

SYNONYMY.

Ceriopora parasitica, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 286.
,, ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 594, pl. xxiii. *b*, fig. 7.
Semicea lamellosa, d'Orbigny, 1853–4. Bry. Crét. p. 1008, pl. 787, figs. 17–20.
,, ,, Pergens, 1890. Revision, p. 389.
,, ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 512.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 314.
,, ,, Pergens, 1895. Bry. Cachemb.: Bull. Soc. belge Géol. vol. viii., Pr. Vb. p. 182.

DIAGNOSIS.

Zoarium irregularly lobed, thick in the middle. Zoœcia narrow tubes, closely packed, and rising obliquely from the centre.

The zoœcia externally are bounded by a slightly raised rim above the front wall (B.M., **D. 4092**).

Aperture rounded, small.

DIMENSIONS.—Diameter of zoœcia: ·22–·26 mm. (Pergens).

DISTRIBUTION.

BRITISH:
Middle Chalk: Chatham.

FOREIGN:
Senonian—Campanian: Rügen.
Santonian?: Cachembach, Eure-et-Loir.
Coniacian: Vendôme and Varennes, Loir-et-Cher.
Turonian—Angoumian: Villardin, Loir-et-Cher.

LIST OF SPECIMENS.

BRITISH.

D. 4092. Two zoaria encrusting *Spondylus*. Middle Chalk. Chatham. Gamble Coll.

D. 412. A vertical section across an echinid plate, with the base of a zoarium (on slide). Middle Chalk. Chatham. Vine Coll.

D. 988. A zoarium on echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 989. A zoarium on echinid fragment (on slide). Middle Chalk. Chatham. Vine Coll.

FOREIGN.

D. 4866. A worn zoarium in the Ceid condition (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

3. **Reptelea oceani** (d'Orbigny), 1850.

SYNONYMY.

Diastopora oceani, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 636, figs. 5, 6.
,, ,, *pars*, Reuss, 1872. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 110, pl. xxvii. fig. 2 (*non* 3).
,, ,, Reuss, 1874. Bry. ob. Plan.: *ibid.* pt. 2, p. 132.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 506.
Reptelea ,, Bucaille, 1853. Bry. Crét. p. 641.
,, ,, (*ex. syn.*), Pergens, 1890. Revision, p. 399.

DIAGNOSIS.

Zoarium large and irregular.

Zoœcia rhomboidal, with rounded angles; arranged irregularly quincuncial.

Apertures triangular.

DISTRIBUTION.

Turonian: Strehlen, Saxony, in Upper Pläner.
Cenomanian: Le Mans, Sarthe; Havre and Cap de la Hève, Seine-Inférieure; Kahlebusch, near Dohna, Saxony, in Lower Pläner.

LIST OF SPECIMENS.

D. 4462. Five worn zoaria (in tube). Cenomanian. Kahlebusch, near Dohna, Saxony. Credner Coll.

D. 7096. A well-preserved zoarium (on slide). Cenomanian. Kahlebusch, near Dohna, Saxony. Credner Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **actæon** (d'Orbigny), 1850.

SYN. *Escharina actæon*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 140.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 604, figs. 5, 6.
Reptelea ,, d'Orbigny, 1853. *Ibid.* p. 640.
,, ,, Pergens, 1890. Revision, p. 399.

CHAR.—Zoarium an irregular encrustation. Zoœcia oval, convex, arranged in a very irregular quincunx. Apertures semicircular.

DISTRIB.—Albian: Grandpré, Ardennes.

2. ? **ligeriensis** (d'Orbigny), 1851.

SYN. *Escharina ligeriensis*, d'Orbigny, 1851. Bry. Crét. pl. 605, figs. 3, 4.
Reptelea ,, d'Orbigny, 1853. *Ibid.* p. 641.
,, ,, Pergens, 1890. Revision, p. 399.

Char.—Zoarium discoid. Zoœcia kite-shaped, tumid. Apertures trigonal.

Distrib.—Senonian—Coniacian: Tours.

3. **piriformis** (Michelin), 1845.

Syn. *Eschara piriformis* (*non* Goldf.), Michelin, 1845. Icon. Zooph. p. 214, pl. liii. fig. 16.

Char.—Zoœcia piriform; apertures small and circular, distant and quincuncial in arrangement.

Distrib.—Cenomanian: Le Mans.

SEMIMULTELEA, d'Orbigny, 1853.[1]

Diagnosis.

Eleidæ with an adnate, multilaminar zoarium. No avicularia.

Type Species.

Semimultelea irregularis, d'Orbigny, 1853. Senonian: France.

Affinities.

This group includes multilaminar species of *Reptelea*.

1. **Semimultelea irregularis**, d'Orbigny, 1853.

Synonymy.

Semimultelea irregularis, d'Orbigny, 1853. Bry. Crét. p. 652, pl. 741, figs. 6–8.
,, *gradata*, d'Orbigny, 1853. Bry. Crét. p. 653, pl. 741, figs. 9–13.
Semielea plana, *pars*, Pergens, 1890. Revision, p. 393.

Diagnosis.

Zoarium of superimposed discs or irregular layers, forming an irregularly cylindrical mass. Aperture triangular; zoœcia rhomboidal and short, separated by ridges.

Dimensions.

	D. 4842.
Diameter of zoœcial group	2 mm.
Diameter of zoœcia	·3 ,,
Diameter of aperture	·2 ,,

---

[1] Bry. Crét. p. 650.

DISTRIBUTION.

Senonian—Maastrichtian: Meudon.
Coniacian: Tours, Indre-et-Loire; Pezou, Loir-et-Cher.
Turonian: Villardin, Loir-et-Cher, in Craie tuffeau and Craie marneuse; Montoire, Loir-et-Cher, in Craie marneuse.

FIGURE.

Fig. 32. A young zoarium, × 15 dia. Turonian: Craie tuffeau. Villardin, Loir-et-Cher. **D. 4842.**

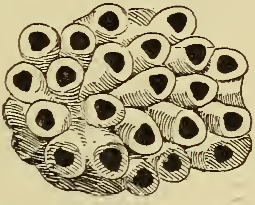

FIG. 32.—*Semimultelea irregularis*, Orb.

AFFINITIES.

This species is included by Pergens in *Reptelea plana*; but in addition to the generic differences, the value of which may be doubtful, the zoœcia are shorter and stouter, with a larger aperture than in *R. plana*.

LIST OF SPECIMENS.

D. 4842. Three young encrusting zoaria (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4867. A large irregular zoarium (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4818. A young zoarium (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4843. A large zoarium (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

2. **Semimultelea acupunctata** (Novak), 1877.

SYNONYMY.

Diastopora acupunctata, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien, vol. xxxvii. pt. 2, p. 99, pl. vi. figs. 1–14.

,, ,, Fric, 1877. Stüd. böhm. Kr., No. 2, Weissenb. Maln. Sch.: Arch. naturw. Landesf. Böhm. vol. iv. pt. 1, pp. 93, 146, fig. 149.

Diastopora acupunctata, Fric, 1883. *Ibid.*, No. 3, Isersch.: *ibid.* vol. v. pt. 2, pp. 81, 124, 125, fig. 104.
Semielea ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 29, pl. ii. fig. 16.

DIAGNOSIS.

Zoarium very irregular, beginning as discoid groups, united to form massive, nodular (and ? subtubular) zoaria. Front wall punctulate.

Zoœcia irregularly lozenge-shaped. Apertures semicircular to trigonal, often with narrow pointed upper end. Closed zoœcia numerous.

DISTRIBUTION.

Turonian: Bezdekau, near Raudnic, Bohemia, in Teplitzer Schichten (Upper Turonian); Chorousek, Gross Ujezd, and Zivonin, Bohemia, in Iser Schichten; Laun, Bohemia, in Malnitzer Schichten; Drinow, Wehlowitz, and Dzban-Rucken, Bohemia, in Weissenberger Schichten (Lower Turonian).
Cenomanian: Kamajk, Kolin, Zbislav, Kank, and Jiné, in Korycaner Schichten.

D. 4424. Two zoaria. Cenomanian. Kamajk, Bohemia, in Korycaner Schichten. Fric Coll., 1898.

UNREPRESENTED SPECIES.

1. ? **cupula**, d'Orbigny, 1853.

SYN. *Semimultelea cupula*, d'Orbigny, 1853. Bry. Crét. p. 651, pl. 741, fig. 14.
,, ,, Pergens, 1890. Revision, p. 399.

CHAR.—Zoarium cupuliform and pedunculate; bilaminar. Zoœcia small. Apertures round. According to Pergens the specimen does not agree with the figure.

DISTRIB.—Cenomanian: Le Mans.

2. ? **cenomana** (d'Orbigny), 1853–4.

SYN. *Reptocea cenomana*, d'Orbigny, 1853–4. Bry. Crét. p. 1009, pl. 788, figs. 1–3.
Semicea ,, Pergens, 1890. Revision, p. 389.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 334.

CHAR.—Zoarium nodular. Zoœcia hexagonal, with rounded angles. About 3 mm. long by ·22 mm. wide. Aperture oval at upper part of the zoœcia.

Distrib.—Cenomanian: Le Mans.

Aff.—Pergens refers *Reptocea recta*, Orb., to the Cheilostomata; and it appears not improbable that this species also should be included in that order.

ELEA, d'Orbigny, 1853.[1]

Synonyms.

Entalophora, *pars*, d'Orbigny, 1850.
Diastopora, *pars*, d'Orbigny, 1851.
Semielea, *pars*, d'Orbigny, 1853; Pergens, 1890.

Diagnosis.

Eleidæ with a Diastoporidan habit, the zoarium consisting of erect, unilaminar, or bilaminar fronds. There are no avicularia.

Type Species.

Elea lamellosa (d'Orbigny), 1850. Senonian: France.

1. Elea lamellosa (d'Orbigny), 1850.

Synonymy.

Bidiastopora	*lamellosa*,	d'Orbigny, 1850.	Prod. Pal. vol. ii. p. 266.
,,	,,	d'Orbigny, 1851.	Bry. Crét. pl. 625, figs. 11–15.
Elea	,,	d'Orbigny, 1853.	*Ibid.* p. 632.
,,	,,	Pergens, 1890.	Revision, p. 398.
,,	,,	Pergens, 1893.	Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 213.
Cea	,,	d'Orbigny, 1853-4.	Bry. Crét. p. 1007, pl. 787, figs. 11–13.
,,	,,	Pergens, 1890.	Revision, p. 391.
,,	,,	Pergens, 1893.	Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 210.

Diagnosis.

Zoarium of broad thin fronds.

Zoœcia rhomboidal, with the angles rounded; they are quincuncial in arrangement. Apertures triangular, with rounded summit. The area below the aperture is tumid.

Dimensions.

	Fide Pergens.
Diameter of zoœcia	·24–·26 mm.
Diameter of aperture: transverse	·12 ,,

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[1] Bry. Crét. p. 627.

DISTRIBUTION.

FOREIGN :

Senonian—Santonian : Saintes, etc., Charente-Inférieure.
Coniacian : Luynes, Tours, Vallières, and Sainte-Christophe, Indre-et-Loire.
Turonian or Coniacian : Vendôme and Varennes, Loir-et-Cher : Sainte-Paterne, Indre-et-Loire.
Turonian—Angoumian : Merpins, Charente.

AFFINITIES.

The inclusion of *Cea lamellosa* in this species appears justified by the figures of d'Orbigny and the descriptions of Pergens. In *Cea lamellosa*, according to Pergens, the zoœcia are "more or less irregularly hexagonal," and are from ·25 to ·3 mm. in diameter; and in *Elea lamellosa* the zoœcia are lozenge-shaped, with rounded angles, and are from ·24 to ·26 mm. in diameter.

LIST OF SPECIMENS.

D. 4687. Part of a frond (on slide). Senonian: Coniacian. Luynes, Indre-et-Loire, in Craie de Villedieu. Purchased 1898.

D. 3770. A fragment (in tube). 'Senonian.' Vendôme, Loir-et-Cher. Gamble Coll.

2. **Elea vieilbanci** (d'Orbigny), 1850.

SYNONYMY.

Entalophora vieilbanci, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 200.
Diastopora ,, d'Orbigny, 1851. Bry. Crét. pl. 637, figs. 7, 8.
Semielea ,, d'Orbigny, 1853. *Ibid.* p. 636, pl. 738, figs. 5–9.
,, ,, Pergens, 1890. Revision, p. 392.
,, ,, Pergens, 1893. Bry. St. Pat. : Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 211.
? ,, ,, Canu, 1897. Bry. Jan. : Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 155.
? ,, ,, Canu, 1897. Bry. St. Cal. : *ibid.* p. 750.
Diastopora dichotoma, d'Orbigny, 1851. Bry. Crét. pl. 638, figs. 6–8.
Semielea ,, d'Orbigny, 1853. Bry. Crét. p. 637.
Diastopora arborescens, d'Orbigny, 1851. Bry. Crét. pl. 638, figs. 1–5.
? *Semimultelea* ,, *pars*, d'Orbigny, 1853. Bry. Crét. p. 652, ? *non* pl. 741, fig. 5.

DIAGNOSIS.

Zoarium of irregular, branched, cylindrical, or compressed tubes; sometimes the compression is sufficient to render the zoarium almost bilaminar.

Zoœcia narrow.

Apertures elliptical or semicircular; arranged in more or less regular transverse rows. The apertures are often closed by an epithecal membrane.

Gonocysts ovoid; about thrice the length of the exposed parts of the zoœcia; rarely developed.

Dimensions.

	B.M.	B.M., D. 4685.	*Fide* Pergens.	
	D. 4679.	Var. *dichotoma*.	Type form.	Var. *dichotoma*.
Diameter of branch ...	3 × 4 mm.	1·5 × 3 mm.		
Diameter of zoœcia ...	·25–·3 ,,	·25–·35 ,,	·26–·3 mm.	·26–·3 mm.
Diameter of aperture: transverse	·11–·14 ,,	·14–·16 ,,	·11–·12 ,,	·18 ,,

Distribution.

Senonian—? Santonian: Saintes.
Coniacian: Tours and Luynes, Indre-et-Loire; Villedieu, Loir-et-Cher.
Turonian: Chinon, in Calcaire jaune; Villavard, Lavardin, Trôot, Sougé, Montoire, and Villardin, Loir-et-Cher, in Craie marneuse; Tourtenay, Deux-Sèvres; Sainte-Maure, Indre-et-Loire; Angoulême, Charente.
? Cenomanian: St. Calais and Janières, Sarthe (*fide* Canu).

Figure.

Fig. 33. A gonocyst and adjacent zoœcia, × 9 dia. Turonian—Calcaire jaune: Chinon. **D. 4674.**

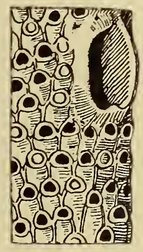

Fig. 33.—*Elea vieilbanci* (Orb.).

Affinities.

D'Orbigny separated some of the specimens from the Coniacian as *S. dichotoma*, which has been accepted by Pergens on the ground of the larger size of the apertures in that form. The variation in this character, however, is considerable, and the two forms occur in both the Turonian and Senonian. Hence it seems better to treat *dichotoma* as only a variety.

Whether the specimen of which d'Orbigny figured a section as *Semimultelea arborescens* (Bry. Crét. pl. 741, fig. 5) belongs to the same species as his original figures, is doubtful.

LIST OF SPECIMENS.

D. 4674. A zoarium with a gonocyst. Turonian: Calcaire jaune. Chinon. Purchased 1898. Figd. No. 33, p. 301.

D. 4681. Six fragments (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4682. Six fragments (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4683. Six fragments (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4684. Three fragments (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4685. One fragment (on slide). Turonian: Craie marneuse. Chinon, Indre-et-Loire. Purchased 1898.

D. 4679. A branched fragment showing blunt distal ends (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4673. A compressed branch (on slide). Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4715. A branched fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4862. Five fragments (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4863. Five fragments (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4864. Two fragments (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4865. A large, compressed irregular fragment (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

? **D. 4821.** Five worn cylindrical fragments (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4675. An irregular specimen with a large central cavity (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4676. Five fragments (on slide). Turonian: Craie marneuse. Villardin, Station, Loir-et-Cher. Purchased 1898.

D. 4677. A fragment with gonœcium (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 3747. Four fragments (on slide). 'Senonian'? Lavardin, Loir-et-Cher. Gamble Coll.

D. 4811. Two branches (on slide). Turonian: Craie marneuse. Villardin Station. Purchased 1898.

D. 4678. Four fragments (on slide). Turonian: Craie marneuse. ? Villardin, Loir-et-Cher. Purchased 1898.

D. 4680. Five fragments, of which one has been ground down to show the basal lamina (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4860. Four fragments of form *arborescens* (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4861. A compressed branch (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4808. Three fragments (on slide, with *Sparsicavea*, sp.). Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4868. A narrow stem (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4936. A zoarium in block of nodular chalk. Turonian: Craie tuffeau. Villardin, Loir-et-Cher. Purchased 1898.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **compressa** (d'Orbigny), 1853–4.

Syn. *Cea compressa*, d'Orbigny, 1853–4. Bry. Crét. p. 1005, pl. 787, figs. 4–6.
,, ,, Pergens, 1890. Revision, p. 391.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 210.
,, *digitata*, d'Orbigny, 1853–4. Bry. Crét. p. 1006, pl. 787, figs. 7–10.

Char.—Zoarium of narrow, thick, dichotomous fronds, with well-marked zoarial lamina. Zooecia hexagonal.

Distrib.—Senonian—Coniacian: Tours, St. Paterne, and Joué, Indre-et-Loire; Vendôme, Loir-et-Cher.

Aff.—Probably the worn Ceid state of *E. hexagona* (Orb.).

2. **hexagona**, d'Orbigny, 1853.

Syn. *Elea hexagona*, d'Orbigny, 1853. Bry. Crét. p. 633, pl. 738, figs. 1–4.
,, ,, Pergens, 1890. Revision, p. 398.
,, ,, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 753.

Char.—Zoarium of thick ribbon-shaped branches, which divide dichotomously. Zooecia hexagonal, quincuncially arranged; bounded by raised ridges. Apertures semicircular.

Distrib.—Senonian—Coniacian (? Turonian): Vendôme, Loir-et-Cher. Cenomanian: St. Calais, Sarthe.

3. **labyrinthica** (Michelin), 1843.

Syn. *Eschara labyrinthica*, Michelin, 1843. Icon. Zooph. p. 124, pl. xxxii. fig. 2.
? *Cea tuberculata*, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 156, pl. v. figs. 11, 12.

Char.—Large zoarium of crumpled bilaminate fronds. Apertures semicircular or trigonal, quincuncially arranged, with a tubercle above each aperture.

Distrib.—Cenomanian: Cap de la Hève, Seine-Inférieure; Honfleur, Villers-sur-Mer, and Vaches-Noires, Calvados; ? Janières, Sarthe.

4. **modesta** (Pocta), 1892.

Syn. *Cea modesta*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 28, pl. iv. figs. 13–17.

Char.—Bilaminar fronds. Zoœcia irregular in shape and arrangement. Fronds in the indeterminable Ceid condition.

Distrib.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

5. **neustriaca** (Michelin), 1843.

Syn. *Eschara neustriaca*, Michelin, 1843. Icon. Zooph. p. 125, pl. xxxii. fig. 3.

Char.—Zoarium of narrow, dichotomous fronds, which sometimes anastomose. Zoœcia rhomboidal, quincuncially arranged. Apertures small.

Distrib.—Cenomanian: Dives and Villers-sur-Mer, Calvados; St. Jean-le-Forest, Orne.

6. **reticulata**, d'Orbigny, 1853.

Syn. *Elea reticulata*, d'Orbigny, 1853. Bry. Crét. p. 629, pl. 782, figs. 9–12.
,, ,, Pergens, 1890. Revision, p. 397.

Char.—Zoarium flat, fronds pierced by round or oval spaces. Zoœcia irregularly quincuncial in arrangement; they are oval, elongated, and surrounded by a raised border. Aperture transversely elongated, rounded above, straight below.

Distrib.—Neocomian: Morteau, Doubs.

7. **rhomboidalis**, d'Orbigny, 1853.

Syn. *Elea rhomboidalis*, d'Orbigny, 1853. Bry. Crét. p. 631, pl. 737, figs. 21–24.
,, ,, Pergens, 1890. Revision, p. 399.
Diastopora ,, Bucaille, 1888. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 506.
? *Eschara dichotoma* (*non* Goldf.), Michelin, 1845. Icon. Zooph. p. 213, pl. liii. fig. 15.

Char.—Zoarium of thick, dichotomous branches, formed of from twelve to fifteen irregularly quincuncial, rhomboidal zoœcia. Zoœcia bordered by a ridge. Aperture triangular.

Distrib.—Cenomanian: Honfleur and Villers, Calvados; Le Mans.

8. **rustica** (d'Orbigny), 1853–4.

Syn. *Cea rustica*, d'Orbigny, 1853–4. Bry. Crét. p 1005, pl. 787, figs. 1–3.
,, ,, Pergens, 1890. Revision, p. 390.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 210.

Char.—Zoarium of thick, dichotomously branched narrow fronds, with irregularly arranged zoœcia.

Distrib.—Senonian—Coniacian: Vendôme, Loir-et-Cher; La Ribochère, Indre-et-Loire.

9. **triangularis** (Michelin), 1840.

Syn. *Eschara triangularis*, Michelin, 1840. Icon. Zooph. p. 5, pl. i. fig. 6.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 140.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 602, figs. 4, 5.
Elea ,, d'Orbigny, 1853. *Ibid.* p. 630, pl. 737, figs. 17–20.
,, ,, Pergens, 1890. Revision, p. 397.

Char.—Zoarium of thick, undulated, or mæandriform fronds. Zoœcia large, rhomboidal, quincuncially arranged; not bounded by ridges. Apertures triangular or trigonal.

Distrib.—Albian: Grandpré, Ardennes.

10. ? **tubulosa** (d'Orbigny), 1853–4.

Syn. *Semicea tubulosa*, d'Orbigny, 1853–4. Bry. Crét. p. 1008, pl. 787, figs. 14–16.
,, ,, Pergens, 1890. Revision, p. 389.

Char.—Zoarium a unilaminar tube. The front wall appears to be thick in the lower median part, which remains as a tooth after the breaking away of the rest of the wall. Zoarial characters resemble those of *Elea vieilbanci* (Orb.).

Distrib.—Senonian—Santonian: Saintes, Charente-Inférieure.
Coniacian: Joué, near Tours, Indre-et-Loire.

11. **turonensis**, d'Orbigny, 1853.

Syn. *Elea turonensis*, d'Orbigny, 1853. Bry. Crét. p. 631, pl. 737, figs. 25–27.
,, ,, Pergens, 1890. Revision, p. 399.

Char.—Zoarium of thin, slightly branched fronds, with very small, quincuncially arranged zoœcia.

Distrib.—? Senonian (Turonian *fide* d'Orbigny): Sainte-Maure, Indre-et-Loire.

Aff.—According to Pergens the type does not correspond with the figure. The species may be founded on a worn fragment of *Elea lamellosa* (Orb.).

12. **velamen** (Pocta), 1892.

Syn. *Semielea velamen*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 29, pl. ii. figs. 14, 15; pl. iii. figs. 16–20.

Char.—Zoarium a broad tube. Zoœcial characters doubtful, and the species may be a *Diastopora*.

Distrib.—Cenomanian: Kank, Bohemia.

NODELEA, d'Orbigny, 1853,[1] *em.*

Synonyms.

Nodelea, pars, d'Orbigny, 1853.
Melicertites, pars, d'Orbigny, 1853; Pergens, 1890.

Diagnosis.

Eleidæ with an erect zoarium of cylindrical branches, composed of a single bundle of zoœcia. Gonœcia ovoid; lateral. Avicularia absent. Closed zoœcia numerous.

Type Species.

Nodelea semiluna, d'Orbigny, 1853. Senonian and Turonian: France.

Affinities.

This genus was founded by d'Orbigny for Eleidæ with cylindrical branches composed of a single bundle of zoœcia, and provided with prominent external 'cellules ovariennes.' As Pergens has remarked, the existence of these structures, which is the only point of separation from *Meliceritites*, is useless as a generic character. Pergens accordingly treated *Nodelea* as a synonym of *Meliceritites*. But this course makes that genus very cumbrous; and those species without avicularia may be conveniently kept distinct under d'Orbigny's name.

The presence or absence of avicularia has usually been regarded as one of the essential differences between the Cyclostomata and the Cheilostomata. Hence to treat it as a generic character among the Eleidæ is hardly to exaggerate its importance.

The genus is one of the nearest of the Eleidæ to *Haploœcia*, with which it agrees in the Entalophoridan habit and the absence of avicularia; it differs, however, by the existence of numerous closed zoœcia.

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[1] Bry. Crét. p. 608.

1. **Nodelea semiluna,** d'Orbigny, 1853.

SYNONYMY.

Nodelea semiluna, d'Orbigny, 1853. Bry. Crét. p. 611, pl. 735, figs. 9–11.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
Meliceritites compressa, pars, Pergens, 1890. Revision, p. 394.
,, *ogivalis*, d'Orbigny, 1853. Bry. Crét. p. 624, pl. 737, figs. 8–10.

DIAGNOSIS.

Branches dichotomous, fairly stout.

Apertures semicircular or subtriangular, and arranged in regular transverse series, disturbed only near the gonœcia. The rows are crowded. Peristomes well raised.

Zoœcia rhomboidal to hexagonal, with a small triangular front wall below the aperture.

Gonœcia about thrice the size of the zoœcia.

DIMENSIONS.

	Fide Pergens (*compressa*).	B.M., D. 4831.
Diameter of branch	—	2 mm.
Diameter of zoœcia	·22–·24 mm.	·25 ,,
Diameter of aperture: transverse	·11 ,,	·15 ,,

FIGURE.

Fig. 34. Part of a somewhat worn branch showing the gonœcia; × 10 dia. Turonian—Craie marneuse: Villardin. **D. 4831.**

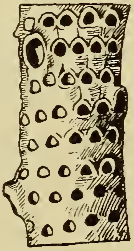

FIG. 34.—*Nodelea semiluna*, Orb.

DISTRIBUTION.

Senonian—Maastrichtian: Royan, Charente-Inférieure.
Santonian: Saintes, Charente-Inférieure.
Coniacian: Tours, Indre-et-Loire; Les Roches, Loir-et-Cher.

Turonian or Coniacian: Villavard, Lavardin, Sougé, Trôot, and Vendôme, Loir-et-Cher.
Turonian: Montoire and Villardin, Loir-et-Cher, in Craie marneuse.

AFFINITIES.

Pergens describes d'Orbigny's figures as bad, and a part of a typical specimen is accordingly here figured (No. 34). The specimen differs from d'Orbigny's representation by having a larger area below the aperture, and the zoœcia accordingly appear hexagonal instead of rhomboidal; but in parts of the zoarium where the transverse rows of apertures are nearer together, the front wall is smaller. *M. ogivalis*, Orb., appears to be this species with the peristomes worn down and thus enlarged.

LIST OF SPECIMENS.

D. 4831. A thin branch with five gonœcia (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898. Figd. No. 34, p. 307.
D. 4832. A branched fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.
D. 4833. A branched fragment (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.
D. 4812. A thin branch of form *ogivalis* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.
D. 4825. A thin branch of form *ogivalis* (on slide). Senonian: Coniacian. South of Les Roches, in Craie de Villedieu. Purchased 1898.

2. **Nodelea cunningtoni**, nov.

DIAGNOSIS.

Zoarium of branches 2–2·5 mm. in diameter; they divide dichotomously, and form a tufted zoarium.

Zoœcia with very long, narrow, axial prolongations. The distal ends are large.

Apertures about twelve in a circuit of a branch. They are arranged in regular, crowded whorls; those of adjacent series are alternate, so that the zoœcia are quincuncial. Apertures triangular or semicircular in shape, with a slightly raised peristome. The aperture is nearly as large as the small triangular front wall.

DIMENSIONS.

Diameter of zoarium	2 mm.
Diameter of aperture	·2 ,,
Diameter of zoœcia	·4 ,,

DISTRIBUTION.

Lower Greensand: Farringdon.

FIGURES.

Fig. 35. Part of a zoarium with well-preserved apertures, × 12 dia. Lower Greensand: Farringdon. Cunnington Coll. **D. 5137.**

Fig. 36. A longitudinal section along a branch, × 6 dia. Lower Greensand: Farringdon. Cunnington Coll. **D. 5131.**

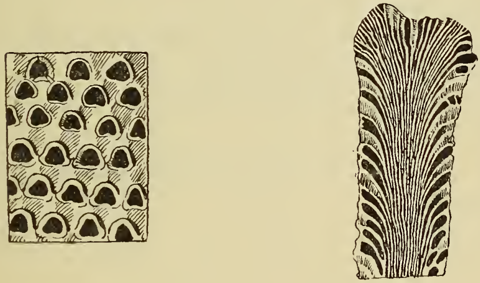

FIG. 35. FIG. 36.

Nodelea cunningtoni, n.sp. Surface and section.

LIST OF SPECIMENS.

D. 5131.	A fragment and slide with longitudinal section cut from it. Lower Greensand. Farringdon, Berks. Cunnington Coll. Figd. No. 36.
D. 5137.	A fragment showing well-preserved zoœcia. Lower Greensand. Farringdon. Cunnington Coll. Figd. No. 35.
D. 5134.	A tufted zoarium. Lower Greensand. Farringdon. Cunnington Coll.
D. 5132.	A fragment and a slide, showing longitudinal section of the axial portion of a zoarium. Lower Greensand. Farringdon. Cunnington Coll.
D. 5136.	Four branched fragments. Lower Greensand. Farringdon. Old Coll. (? Wetherell Coll.).
D. 5133.	Three branched fragments. Lower Greensand. Farringdon. Cunnington Coll.
? **60,539.**	Sixteen fragments of worn axial portions, probably of this species. Lower Greensand. Farringdon. Cunnington Coll.
? **D. 5135.**	A worn axial fragment. Lower Greensand. Farringdon. Old Coll.

3. Nodelea durobrivensis,[1] nov.

DIAGNOSIS.

Zoarium of thin branches.

Zoœcia varying in external shape from sub-hexagonal to kite-shaped, being rounded and arched above, and tapering to a sharp point below. The interzoœcial margins are more or less distinct.

Apertures subcircular or subtrigonal; large. The peristomes are raised well above the general surface. They occur quincuncially, in spirals; but locally they are irregular.

Closed cells numerous; the cap is complete or pierced by a pore; and a pore pierces the front wall of some zoœcia.

Gonocysts projecting, piriform, and large.

DIMENSIONS.

	B.M., D. 4112.	B.M., D. 2699.	B.M., D. 2718.
Diameter of branch ...	1·8 mm. ...	1·5 mm. ...	1·5 mm.
Diameter of zoœcia ...	·3 ,, ...	·5 ,, ...	·30 ,,
Diameter of aperture ...	·2 ,, ...	·2 ,, ...	·16–·20 ,,

DISTRIBUTION.

BRITISH :

Upper Chalk: Bromley; Gravesend; Clarendon, Wilts, in zone of *Belemnitella mucronata.*
Middle Chalk: Chatham.
Chalk: Dover.

FIGURES.

Pl. XIV. Fig. 4. Part of a zoarium in which most of the zoœcia are closed, sometimes with a conical, perforated cap; one zoœcium has two pores in the wall below the peristome; a broken gonocyst also occurs: × 15 dia. Middle Chalk: Chatham. Vine Coll. **D. 2718.**

Pl. XIV. Fig. 5. Part of a branch in which the front walls of the zoœcia are tumid; many of the zoœcia are closed: × 8 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4112.**

Pl. XIV. Fig. 6. Part of a zoarium with more widely spaced zoœcia, some of which are closed and some have a sub-peristomal pore; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 2699.**

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[1] From Durobrivis, the Roman station near Chatham.

Pl. XIV. Fig. 7. Part of a branch with irregularly arranged zoœcia, many of which are closed by a two-pored cap; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 351.**

Pl. XIV. Fig. 8. Part of a zoarium with a broken gonocyst; × 16 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3997.**

Pl. XIV. Fig. 9. Part of the base of a zoarium; the base of the erect stem is seen by the lower edge of the figure: × 7 dia. Middle Chalk: Chatham. Gamble Coll. **D, 4243.**

Pl. XIV. Fig. 10. A branch with a piriform gonocyst; × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3996.**

Pl. XIV. Fig. 11. Part of a branch covered by a thin epithecal crust; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3992.**

Pl. XIV. Fig. 12. Part of a thin branch with a broken gonocyst; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 359.**

Pl. XIV. Fig. 13. Part of a branch with a complete, ovoid gonocyst; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 359.**

LIST OF SPECIMENS.

D. 2718. A fragment with mostly closed zoœcia, a zoœcium with a suboral pore, and a gonocyst. Middle Chalk. Chatham. Vine Coll. Figd. Pl. XIV. Fig. 4.

D. 4112. A typical fragment (on flint). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIV. Fig. 5.

D. 2699. A branch with ringed closures and some zoœcia with a central pore. Middle Chalk. Chatham. Vine Coll. Figd. Pl. XIV. Fig. 6.

D. 351. Two fragments with the closed zoœcia; many of the closed zoœcia have double pores. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIV. Fig. 7.

D. 3997. A branch, on an irregular variety, with gonocyst (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIV. Fig. 8.

D. 4243. A base on an echinid fragment. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIV. Fig. 9.

D. 3996. Two branches, one with gonocyst (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIV. Fig. 10.

D. 3992. Three fragments (on slide). The largest specimen is partly covered by an epithecal crust, beneath which the apertures are marked only by small spiny elevations. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIV. Fig. 11.

D. 359. Two fragments with gonocysts (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIV. Figs. 12 and 13, one broken with three internal apertures.

D. 354. Three specimens (on slide), one showing transverse and another longitudinal sections. Middle Chalk. Chatham. Gamble Coll.

D. 355. A slide with three specimens. Middle Chalk. Chatham. Gamble Coll.

D. 357. Two specimens, one showing longitudinal section. Middle Chalk. Chatham. Gamble Coll.

D. 358. A slide with three specimens: 1 and 3 = *N. durobrivensis*; 2 = *Meliceritites ogivalis*, Orb. Middle Chalk. Chatham. Gamble Coll.

D. 484. Two zoaria, one with base (on flints). Middle Chalk. Chatham. Gamble Coll.

D. 622. Two branches (on slide). Middle Chalk. Chatham. Vine Coll., No. 104. Identified as *M. propinqua.*

D. 623. Four branches (on slide). Middle Chalk. Chatham. Vine Coll., No. 103.

D. 624. A specimen (on a slide) with two specimens of *Meliceritites lonsdalei*, Greg. Middle Chalk. Chatham. Vine Coll.

D. 2628. Two branches (on slide); one is worn in part, rendering the interzoœcial sutures conspicuous, and from its hexagonal aspect gives the branch a resemblance to *Meliceritites propinqua* (Mars.). Middle Chalk. Chatham. Vine Coll.

D. 2704. Two fragments (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2727. A branched fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2731. A branched fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2739. A long fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2839. Three fragments with zoœcia rather larger in diameter than usual. Upper Chalk. Bromley. Simmons Coll.

D. 3112. A branched fragment: the zoœcia in one belt are all closed; in another all the zoœcia are open, and the specimen differs from *Entalophora madreporacea*, Orb. (Bry. Crét. pl. 623, fig. 2), only by the apertures not being circular. Upper Chalk. Bromley. J. Simmons Coll.

D. 3114. A branched zoarium. Upper Chalk. Gravesend. Old Coll.

D. 3117. A worn branched zoarium (in chalk). Chalk. Dover. Old Coll.

D. 3820. A base on echinid fragment, with *Proboscina cornucopiæ* (Orb.). Middle Chalk. Chatham. Gamble Coll.

D. 3991. Two fragments in the same condition as **D. 351.** Middle Chalk. Chatham.

D. 3993. Two fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3994. Three irregular branches (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 3998. Four fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4053. A base on an echinid fragment. Middle Chalk. Chatham. Gamble Coll.

D. 4079. A well-preserved branch with gonocyst (on flint). Middle Chalk. Chatham. Gamble Coll.

D. 4100. A branch on which is growing a specimen of *Clausa*. Middle Chalk. Chatham. Gamble Coll.

D. 4121. A branched fragment (in chalk). Middle Chalk. Chatham. Gamble Coll. Determined by Pergens as *M. docens*, Nov.

D. 4122. A branch on flint; most of the surface is worn, and the front walls broken through, but in one part is a series of double-pored closed zoœcia. Middle Chalk. Chatham. Gamble Coll.

D. 4140. A small branched fragment (on flint). Middle Chalk. Chatham. Gamble Coll.

D. 4201. Two bases with part of erect stems. Middle Chalk. Chatham. Gamble Coll.

D. 4301. A group of worn branches. Upper Chalk, zone of *Belemnitella mucronata*. Clarendon, Wiltshire. Gamble Coll.

D. 4341. A long branch on flint and a longitudinal section cut from the same. With *Sparsicavea carantina* (Orb.). Middle Chalk. Chatham. Gamble Coll.

D. 4524. A long cylindrical branch. Chalk. Loc.? Old Coll.

D. 4525. Three branches (on chalk). Chalk. S.E. England. Toulmin Smith Coll.

D. 4526. Two pieces of chalk with ramified branches. Chalk. S.E. England. Toulmin Smith Coll.

D. 4527. The worn central axes of two long branches (in chalk). Chalk. Loc.? Old Coll.

D. 4530. A thin branch with gonocyst (in chalk). Middle Chalk. Chatham. Gamble Coll.

D. 4949. A fragment with knob-shaped outgrowth (on slide). Middle Chalk. Chatham. Gamble Coll.

4. **Nodelea micropora** (d'Orbigny), 1853.

SYNONYMY.

Meliceritites micropora, d'Orbigny, 1853. Bry. Crét. p. 621, pl. 737, figs. 4-7.
,, ,, Pergens, 1890. Revision, p. 397.

DIAGNOSIS.

Zoarium of thick, solid branches, with from twenty to twenty-five apertures in a circuit of the stem. Zoœcia small and ovoid; not separated by raised ridges. Aperture triangular. Peristomes not raised.

DISTRIBUTION.

Senonian—Coniacian: Villedieu and Les Roches, Loir-et-Cher.
Turonian: Villardin and Montoire, Loir-et-Cher, in Craie marneuse.

AFFINITIES.

This species, by its zoœcial characters, resembles *Elea vieilbanci*, but the peristomes are less raised and the stems solid.

LIST OF SPECIMENS.

D. 4807. One branch (on slide). Senonian: Craie de Villedieu. South of Les Roches. Purchased 1898.

D. 4830. A thin branched fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4816. Three fragments (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4813. Three fragments (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

?**D. 4810.** A worn zoarium probably of this species. Turonian: Craie marneuse. Villardin. Purchased 1898.

5. **Nodelea geinitzi** (Reuss), 1872–3.

SYNONYMY.

Entalophora geinitzi, von Reuss, 1872. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 117, pl. xxix. figs. 6, 7.

" " Novak, 1877. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 107, pl. vii. figs. 1–10.

" " Fric, 1877. Isersch.: Arch. naturw. Landesf. Böhm. vol. v. pt. 2, p. 125, fig. 106.

DIAGNOSIS.

Zoarium of long, thin branches.

Zoœcia long and somewhat flexuous, and closely united throughout. The external face may be quadrangular, lozenge-shaped, or sub-hexagonal. The distal ends of the zoœcia are expanded, and contract to a small, submarginal aperture.

Apertures locally tending to a serial arrangement: about twelve to eighteen in a circuit of the stem.

DIMENSIONS.

Diameter of branch	1·5 mm.
Diameter of zoœcia	·3 "
Diameter of aperture	·2 "

DISTRIBUTION.

Lower Turonian: Vtelno, Bohemia, in Iser Schichten.

Cenomanian: Lower Saxony, in Upper Pläner and Quader; Kank, Bohemia, in Korycaner Schichten.

LIST OF SPECIMENS.

D. 4428. A branched zoarium. Iser Schichten. Vtelno, Bohemia. Fric Coll., 1898.

D. 7051. A worn fragment (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll., 1898.

6. **Nodelea marticensis,** d'Orbigny, 1853.

SYNONYMY.

Nodelea marticensis, d'Orbigny, 1853. Bry. Crét. p. 609, pl. 735, figs. 1–3.
,, ,, Pergens, 1890. Revision, p. 399.

DIAGNOSIS.[1]

Zoarium of narrow branches, with well-raised peristomes, which occur in regular transverse series.

Apertures are circular or subcircular. The peristomes are not connected by ridges along the interzooecial sutures.

DISTRIBUTION.

Turonian: Martigues, Bouches-du-Rhône; St. Rimay and Villardin, Loir-et-Cher, in Craie marneuse.

LIST OF SPECIMENS.

D. 4815. A branched, irregular zoarium (on slide). Turonian: Craie marneuse. St. Rimay. Purchased 1898.

D. 4828. Four fragments (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4829. Two thin fragments (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **gualteri** (Mantell), 1844.

SYN. *Retepora gualteri*, Mantell, 1844. Med. Creat. vol. i. p. 286, fig. 8 (on p. 284).

CHAR.—A thin worn branch in the Ceid condition.

DISTRIB.—Chalk: Chichester.

2. **squamata** (Marsson), 1887.

SYN. *Meliceritites squamata*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 47, pl. iv. fig. 9.

CHAR.—Cylindrical stems with hexagonal zooecia, large semicircular apertures, and zones of numerous closed zooecia.

DISTRIB.—Senonian—Campanian: Rügen.

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[1] According to Pergens the type-specimen is worn, so that its characters are doubtful.

MULTELEA, d'Orbigny, 1853.

[Bry. Crét. p. 643.]

SYNONYMS.

Cricopora, pars, Michelin, 1840.
Escharites, pars, Römer, 1840.
Vaginopora, pars, von Hagenow. 1846.
Melicertites, pars, d'Orbigny, 1853; Pergens, 1890.

DIAGNOSIS.

Eleidæ with a multilamellar zoarium of erect cylindrical branches. No avicularia present.

TYPE SPECIES.

Multelea magnifica, Orb. Senonian: France. (This species may be accepted as the type as it is the best figured and the commonest.)

Multelea magnifica, d'Orbigny, 1853.

SYNONYMY.

Multelea magnifica, d'Orbigny, 1853. Bry. Crét. p. 649, pl. 740.
,, ,, Hamm, 1881. Bry. mastr. Ober-Sen. p. 46.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
Meliceritites ,, Pergens, 1890. Revision, p. 397.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 211.
,, ,, Pergens, 1895. Bry. Arche de Lèves: *ibid.* vol. viii., Pr. Vb. p. 138.
,, ,, Pergens, 1895. Bry. Cachemb.: *ibid.* vol. viii., Pr. Vb. p. 182.

DIAGNOSIS.

Zoarium of thick, dichotomous branches.

Apertures triangular; in transverse series. "Between most of the zoœcia are the orifices of the ovicells, particularly numerous in this species" (Pergens).

DISTRIBUTION.

Senonian—Maastrichtian: Sainte-Colombe, Manche; Royan, Charente-Inférieure.
Santonian: Saintes, etc., Charente-Inférieure; L'Arche de Lèves and Cachembach, near Chartres.

Coniacian: Tours, Joué, St. Paterne, La Ribochère, and Saint-Christophe, Indre-et-Loire; Villedieu, Vendôme, and Lavardin, Loir-et-Cher.
? Turonian: Merpins, Charente; Gros-Pirous, near Martigues, Bouches-du-Rhône.

D. 3740. A small worn fragment, identified as this species by M. Pergens (on slide). 'Senonian.' Sainte - Paterne, Indre - et - Loire. Gamble Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. ? **bimarginata** (Römer), 1840.

SYN. *Escharites bimarginata*, Römer, 1840. Verst. nordd. Kr. p. 17, pl. v. fig. 14.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
Vaginopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 602.
Multelea ,, Brauns, 1875. Sen. Salzb.: Zeit. Ges. Naturw. vol. xlvi. p. 400.

CHAR.—Stout, dichotomous branches. Zoœcia rhomboidal. Apertures large, semicircular, quincuncially arranged.

DISTRIB.—Senonian—Santonian: Salzberg, near Quedlinburg.

AFF.—This species is included in *Multelea* in deference to the opinion of Brauns.

2. **foricula** (d'Orbigny), 1853.

SYN. *Meliceritites foricula*, d'Orbigny, 1853. Bry. Crét. p. 621, pl. 737, figs. 1-3.
,, ,, Pergens, 1890. Revision, p. 396.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 211.
,, ,, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 753.
Multelea semiluna, d'Orbigny, 1853. Bry. Crét. p. 646, pl. 739, figs. 8-11.
,, *divergens*, d'Orbigny, 1853. Bry. Crét. p. 646, pl. 739, figs. 4-7.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. sci. nat. Rouen, vol. xxv. p. 507.
,, ,, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 154.

CHAR.—Zoarium of stout, dichotomous branches. Apertures subtriangular, in transverse series. Zoœcia externally hexagonal or ? rhomboidal.

DISTRIB.—Senonian—Coniacian: La Ribochère and St. Paterne, Indre-et-Loire.
Turonian: Sainte-Maure, Indre-et-Loire; Martigues, Bouches-du-Rhône; Angoulême, Charente.
Cenomanian: Havre; Janières and St. Calais, Sarthe.

Aff.—The name of this species is accepted in deference to Pergens' opinion, who states that d'Orbigny's figure of *M. foricula* is bad. Unless the figure is very incorrect the specific identity of *foricula* with the other two forms appears improbable.

3. **inæqualis,** d'Orbigny, 1853.

Syn. *Multelea inæqualis,* d'Orbigny, 1853. Bry. Crét. p. 647, pl. 739, figs. 12-16.
Melicertites ,, Pergens, 1890. Revision, p. 396.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 211.

Char.—Branches thick and dichotomous. Zoœcia quadrangular, rounded above. Aperture large, with a straight lower margin.

Distrib.—Senonian—Maastrichtian: Meudon.
Coniacian: St. Paterne, Indre-et-Loire.

Aff.—This species is probably identical with *M. bimarginata* (Röm.).

4. **irregularis,** d'Orbigny, 1853.

Syn. *Multelea irregularis,* d'Orbigny, 1853. Bry. Crét. p. 644, pl. 782, figs. 13-16.
,, ,, Pergens, 1890. Revision, p. 644.

Char.—Zoarium of thick branches, which anastomose and dichotomize. Apertures triangular; their arrangement is irregularly subquincuncial. Zoœcia hexagonal.

Distrib.—Neocomian: Sainte-Croix.

Aff.—A lower Cretaceous ally of *M. foricula* (Orb.).

5. **orphanus,** Novak, 1877.

Syn. *Multelea orphanus,* Novak, 1877. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 112, pl. vi. figs. 15-21.
,, *laevirieri,* Peron, 1888. Craie Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. p. 343, pl. iii. fig. 30.
Cricopora gracilis (*non* Goldf.), Michelin, 1840. Icon. Zooph. p. 4, pl. i. fig. 8.
Entalophora ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 140.
Multelea ,, d'Orbigny, 1853. Bry. Crét. p. 645, pl. 739, figs. 1-3.

Char.—Zoarium of thick, dichotomous branches. Zoœcia externally lozenge-shaped, crowded, and quincuncial. Apertures small, round at the upper angle.

Distrib.—Cenomanian: Larrivour, near Troyes; Korycan, Bohemia, in Korycaner Schichten.
Albian: Grandpré, Ardennes.

6. **simplex,** d'Orbigny, 1853.

SYN. *Multelea simplex,* d'Orbigny, 1853. Bry. Crét. p. 648, pl. 739, figs. 17–19.
,, ,, Peron, 1888. Craie Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. p. 225.
,, ,, Pergens, 1890. Revision, p. 399.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 212.

CHAR.—Founded, according to Pergens, on an indistinct specimen. Apertures described by d'Orbigny as small and round; the peristomes are raised and bead-like. Apertures irregularly quincuncial in distribution.

DISTRIB.—Senonian—Campanian: Rheims and Epernay.
Turonian or Coniacian: Sougé and Trôot, Loir-et-Cher; St. Paterne, Indre-et-Loire.

REPTOCERITITES,[1] nov.

DIAGNOSIS.

Eleidæ with a Berenicoid zoarium of a single, adnate layer of zoœcia. Avicularia and some closed zoœcia occur.

AFFINITIES.

This genus differs from *Reptelea* by the presence of avicularia. It is the simplest zoarium of the *Meliceritites* section of the Eleidæ. Its nearest ally is the multilamellar genus *Reptomultelea.*

TYPE SPECIES.

Reptoceritites rowei, n.sp. Middle Chalk: Chatham.

Reptoceritites rowei, nov.

DIAGNOSIS.

Zoarium elliptical or reniform.

Zoœcia irregularly arranged. The peristomes are well raised. The aperture is almost terminal, and often circular: it is sometimes subtriangular.

Avicularia long; the depression for the mandible is hastate, or may be expanded at both ends, and is twice the length of the zoœcial apertures.

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[1] The reptant form of *Meliceritites*.

DIMENSIONS.

Diameter of zoarium	6 × 8 mm.
Diameter of zoœcia	·35 ,,
Diameter of aperture	·2–·25 ,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURES.

Pl. XVI. Fig. 6*a*, zoarium, nat. size. Fig. 6*b*, part of the same, × 14 dia. **D. 4244.**

D. 4244. A zoarium on an echinid fragment. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVI. Fig. 6.

REPTOMULTELEA, d'Orbigny, 1853.[1]

SYNONYMS.

? *Escharina*, *pars*, d'Orbigny, 1851.
? *Reptelea*, *pars*, d'Orbigny, 1853.
Semielea, *pars*, Pergens, 1890.

DIAGNOSIS.

Eleidæ with an encrusting, multilamellar zoarium, with well-developed avicularia, and closed zoœcia.

TYPE SPECIES.

Reptomultelea tuberosa, d'Orbigny, 1853. Cenomanian: France.

AFFINITIES.

By the Reptomultisparsan habit of this species it resembles *Semimultelea*; but it differs from that group by the presence of avicularia.

1. Reptomultelea tuberosa, d'Orbigny, 1853.

SYNONYMY.

Reptomultelea tuberosa, d'Orbigny, 1853. Bry. Crét. p. 655, pl. 741, figs. 14, 15.
? *Escharina sarthacensis*, d'Orbigny, 1851. *Ibid.* pl. 604, figs. 9, 10.

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[1] Bry. Crét. p. 654.

? *Reptelea sarthacensis,* d'Orbigny, 1853. *Ibid.* p. 640.
Semielea ,, Pergens, 1890. Revision, p. 393.
,, ,, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 155, pl. v. fig. 10.
? ,, ,, Canu, 1897. Bry. Jan.: *ibid.* p. 749.
? *Diastopora* ,, *pars,* Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 506.
non Escharina sarthacensis, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 175.
non Cellepora ,, d'Orbigny, 1853. Bry. Crét. p. 394.
? *non Eschara piriformis* (*non* Goldf.), Michelin, 1845. Icon. Zooph. p. 214, pl. liii. fig. 16.

DIAGNOSIS.

Zoarium massive, of irregular layers. Zoœcia rhomboidal. Aperture triangular; quincuncial in arrangement: as large as the front wall. Avicularia somewhat hour-glass shaped, and formed by two zoœcia.

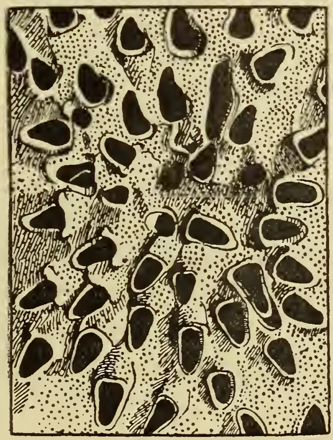

FIG. 37.—*Reptomultelea tuberosa,* Orb. Centre of a zoœcial group.

DISTRIBUTION.

BRITISH:

Upper Greensand: Ventnor.

FOREIGN:

Turonian: Villardin, Loir-et-Cher, in Craie marneuse.
Cenomanian: Le Mans, St. Calais, and Janières, Sarthe.

FIGURE.

Fig. 37. Part of a zoarium including a zoœcial centre, × 13 dia. Upper Greensand: Ventnor, Isle of Wight. M. Norman Coll. **36,746.**

Affinities.

Escharina sarthacensis may be the young, unilaminar stage of this species. But even so, the specific name of *tuberosa* is preferable; as when d'Orbigny figured *Escharina sarthacensis* in 1851 either he regarded that as identical with his *Escharina sarthacensis* of 1850 (Prod. Pal. vol. ii. p. 175), or the name was a synonym.

36,746. A large zoarium, 70 mm. long by 55 mm. wide. Upper Greensand. Ventnor, Isle of Wight. M. Norman Coll. Figd. No. 37.

2. Reptomultelea sarissata,[1] nov.

Diagnosis.

Zoarium of numerous layers. Closed zoœcia numerous; in clusters.

Apertures trigonal; often crowded, and larger than the triangular suboral wall of the zoœcia. The apertures are quincuncial and arranged on curved lines.

Avicularia numerous, with a long tapering upper end.

Dimensions.

Diameter of zoœcia	·4 mm.
Diameter of aperture	·25 ,,
Length of avicularian aperture	·3 ,,
External length of avicularium	1·8 ,,

Distribution.

Upper Chalk: Beachy Head.

Figures.

Pl. XVI. Fig. 7. Part of the surface of a zoarium, × 10 dia. Upper Chalk: Beachy Head. Presented by the author. **D. 7106.**

Affinities.

This Bryozoan is most nearly allied to *Reptomultelea tuberosa*, Orb., from which it differs most markedly in the shape of the avicularia; they are lanceolate and not hour-glass shaped.

D. 7106. A large zoarium. Upper Chalk. Beachy Head.

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[1] Armed with a 'sarissa,' the long Macedonian spear; from the shape of the avicularia.

UNREPRESENTED SPECIES.

? **reussi** (Pergens), 1890.

Syn. *Semielea reussi*, Pergens, 1890. Revision, p. 399.
,, ,, Pergens, 1892. Nouv. Cycl.: Bull. Soc. belge Géol. vol. iv. p. 278, pl. xi. fig. 7.
Reptelea oceani (*non* Orb.), von Reuss, 1873. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 110, pl. xxvii. fig. 3 (*non* fig. 2).

Char.—Zoœcia short, piriform. Peristomes thickened. Apertures semicircular to triangular. Avicularia a little longer than the normal zoœcia, with long spatulate aperture. Suboral pores in some zoœcia.

Distrib.—Cenomanian: Plauen, Saxony.

MELICERITITES,[1] Römer, 1840.

[Verst. nordd. Kr. p. 18.]

Synonyms.

Meliceritites, Römer, 1840.
Ceriopora, *pars*, Goldfuss, 1827.
Escharites, *pars* (*non* Schlotheim), Römer, 1840.
Vaginopora, von Hagenow, 1846.
? *Chisma*, Lonsdale, 1849.
Nodelea, *pars*, d'Orbigny, 1853; Marsson, 1887.

Diagnosis.

Eleidæ with a zoarium of erect cylindrical branches composed of one bundle of zoœcia. Avicularia present and usually closed zoœcia, gonocyst, and (? spiniferous) tubercles.

Type Species.

Ceriopora gracilis, Goldfuss, 1827. Cenomanian: Essen.

Affinities.

Meliceritites was the first founded genus of the Eleidæ, and accordingly the family is often called the Melicerititidæ. The genus was founded by Römer for three species—*Ceriopora gracilis*, Goldf., *Ceriopora roemeri*, Hag., and *M. porosa*, Röm. The first species was the earliest recognized, and is most conveniently accepted as the type species; for it was the first on Römer's list, and it has been maintained that the other two species were synonymous with it. Thus, *M. porosa*, Röm., is probably only a worn fragment of *M. roemeri* (Hag.) from Rügen, which Marsson, the monographer of the Rügen Bryozoa, maintained to be a synonym of *M. gracilis*.

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[1] This name is often spelt *Meliceertites*; but it was spelt *Meliceritites* by Römer, and the abbreviated form is clearly incorrect, as the genus is regarded as an ally of *Melicerita*, not as a fossil *Melicerta*, which is a Rotifer.

The original type of *M. gracilis* is a worn fragment, with all the external surface obliterated. The figure is generically indeterminable; but Römer gave a figure of a specimen from the same locality as the type, in which the zoœcial characters are clearly shown. That Römer's identification of this specimen was correct is proved by a specimen from Essen in the Museum collection. The specimen (No. **D. 3638**) is much broken externally, and part of the surface, as shown on Fig. 38*b*, agrees with Goldfuss' figure; another part of the specimen, shown on Fig. 38*a*, agrees with Römer's figure. Moreover, that the main differences between the *Ceriopora gracilis* and *C. roemeri* are only due to preservation is supported by the opinion of Marsson,[1] who referred to the latter as "including the more complete specimens [of *C. gracilis*], with the 'Zelldecke' retained."

Hence there can be no doubt that *C. gracilis*, Goldf., is an Eleid; and the Museum collection includes one specimen with what appear to be ill-preserved avicularia. I had not seen this specimen when preparing the Catalogue of Jurassic Bryozoa, and accordingly suggested (p. 157) that *Meliceritites gracilis* was different from *M. roemeri*, and was only a worn Entalophorid.

The two chief synonyms of *Meliceritites* are *Escharites*, Röm., which was published simultaneously, but was preoccupied by Schlotheim, and *Vaginopora*, proposed by von Hagenow in 1846.

1. **Meliceritites gracilis** (Goldfuss), 1827.

SYNONYMY.

Ceriopora gracilis, Goldfuss, 1827. Petref. Germ. vol. i. p. 35, pl. x. fig. 11.
,, ,, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 282.

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[1] Marsson. Bry. Rüg.: Pal. Abh. vol. iv. p. 47.

non Ceriopora gracilis, Michelin, 1845. Icon. Zooph. p. 210, pl. liii. fig. 2.
non ,, ,, d'Archiac, 1846. Crét. Vers. Plat. centr.: Mém. Soc. géol. Fr., ser. 2, vol. ii. p. 78.
Alveolites ,, de Blainville, 1830. Zooph.: Dict. Sci. nat. vol. lx. p. 370.
,, ,, de Blainville, 1834. Man. Act. p. 405.
Meliceritites ,, Römer, 1840. Verst. nordd. Kr. p. 18, pl. v. fig. 13.
,, ,, d'Orbigny, 1853. Bry. crét. p. 617.
,, ,, Simonowitsch, 1871. Bry. Ess. Grüns.: Verh. nat. Ver. pr. Rheinl. vol. xxviii. p. 66.
,, ,, (*ex. syn.*), von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 120, pl. xxix. figs. 12–16.
,, ,, von Reuss, 1874. Bry. ob. Plän.: *ibid.* vol. xx. pt. 2, p. 135.
non ,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 46.
non ,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 46, pl. iv. fig. 8.
,, ,, *pars*, Pergens, 1890. Revision, p. 394.
,, ,, *pars*, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 752; *non* pl. xxii. figs. 1, 2.
Escharites ,, *pars*, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
non ,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 56, pl. i. fig. 15.
? *Entalophora* ,, Vine, 1884. Fourth Rep.: Rep. Brit. Assoc. 1883, p. 166.
non ,, ,, var., Vine, 1887. Ent. Neoc. Lincolnsh.: Ann. Mag. Nat. Hist. ser. 5, vol. xix. pp. 17–19.

DIAGNOSIS.

Zoarium of thin branches.

Apertures quincuncial or in spiral series; crowded; when perfect the apertures are triangular to subtrigonal. In worn zoœcia the aperture is large and elliptical, and often crossed by a suboral bar.

Avicularian zoœcia as large as the normal zoœcia, with long, triangular apertures.

DIMENSIONS.

	B.M., D. 3638.
Diameter of branch	2–2·5 mm.
Diameter of zoœcia	·34 ,,
Diameter of aperture	·16 ,,

DISTRIBUTION.

Cenomanian: Essen; Le Mans; St. Calais; Plauen, Saxony.

Figures.

Fig. 38*a*, part of a specimen showing some well-preserved zoœcia; Fig. 38 *b*, part of another specimen with suboral bar as in Goldfuss' figure: × 15 dia. Essen Greensand: Essen. Old Coll. **D. 3638.**

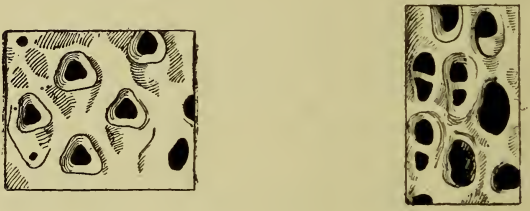

Fig. 38.—*Meliceritites gracilis* (Goldf.).

Affinities.

The synonymy of this species is somewhat complex. Goldfuss founded it on a worn branch which does not show the apertures; but that they had a thickened lower lip is probably owing to the occurrence of a suboral bar, which is no doubt the strong lower part of the peristome. Römer figured a well-preserved specimen which shows that the apertures are small and trigonal. Michelin identified as this species a specimen from Le Mans, which d'Orbigny in 1853 renamed *M. cenomana.*

The Senonian representative of this species is *M. roemeri* (Hag.), with better developed avicularia. The open triangular apertures of the avicularia in *M. gracilis* are indicated in a Museum specimen, but the evidence is not very satisfactory. Confirmation of this character is needed.

LIST OF SPECIMENS.

D. 3638.	Two specimens retaining the front wall in places; in other parts the front wall has been broken, and the lozenge-shaped aperture is crossed by the suboral bar (as in Goldfuss' original figure). Cenomanian: Essener Grünsand. Essen-am-Ruhr, Westphalia. Old Coll. Figs. 38*a*, *b*.
60,554.	A series of fragments. Cenomanian. Essen. Purchased 1877.
D. 3636.	A series of specimens, mostly worn. Cenomanian. Essen. Old Coll.
? **D. 3637.**	Fragment of a reticulate zoarium (on slide). Cenomanian. Essen. Old Coll.

2. **Meliceritites (Chisma) furcillata** (Lonsdale), 1849.

SYNONYMY.

Chisma furcillatum, Lonsdale, 1849. Foss. Zooph.: Quart. Journ. Geol. Soc. vol. v. p. 98, pl. v. figs. 24–28.

,, ,, Bristow, 1889. Geol. I. of Wight, 2nd ed., p. 258.

DIAGNOSIS.

Zoarium of long, thin branches, which subdivide repeatedly and frequently anastomose. The number of zoœcia in the branches is small. The zoœcia taper gradually towards their proximal ends, so that the distinction between the axial bundle and the external zone is indefinite.

Apertures small, circular, with low peristomes. They occur at the upper corner of a lozenge-shaped area. The apertures are arranged subquincuncially, with a tendency towards an irregular spiral. Avicularia?

DIMENSIONS.

Diameter of a branch	1·3–1·6 mm.
Diameter of aperture	·08–·1 ,,
Diameter of zoœcia	·15–·2 ,,

DISTRIBUTION.

ENGLAND:

Lower Greensand—Atherfield Clay: Atherfield, and east of Ladder, Shanklin; east side of Compton Bay.

FIGURES.

Pl. XI. Fig. 14. Part of a branch showing the front wall partially preserved, × 15 dia. Atherfield Clay: east of Ladder, Shanklin. Caleb Evans Coll. **D. 2007.**

Pl. XI. Fig. 15. Part of a thin, longitudinal section, × 7 dia. The specimen was figured by Lonsdale, Quart. Journ. Geol. Soc. vol. v. pl. v. fig. 26; the section has been reground. Atherfield Clay: Atherfield. Morris Coll. **D. 4545.**

AFFINITIES.

Lonsdale founded the genus *Chisma* for this species, which, if a *Meliceritites*, is the first representative. Should, however, there be no avicularia present in this species, the genus *Chisma* may be retained. The specimens in the Museum collection are mostly worn, so that the absence of avicularia cannot be asserted. The general zoœcial characters are much like those of *Meliceritites semiclausa*, but their shape is lozenge-shaped rather than hexagonal.

LIST OF SPECIMENS.

46,803. A large branched zoarium. Lower Greensand: Atherfield Clay. Atherfield. Morris Coll. Figd. by Lonsdale, 1849: Quart. Journ. Geol. Soc. vol. v. pl. v. fig. 24.

D. 4541. Two fragments of the same. Figd. Lonsdale, *op. cit.* pl. v. fig. 25.

D. 4545. Two sections of the same, one of which has been figured by Lonsdale, *op. cit.* pl. v. fig. 26; and is refigured pl. xi. fig. 15.

D. 4542. Three fragments of the same, one of which was figured by Lonsdale, *op. cit.* pl. v. fig. 28.

D. 4543. Two fragments of the same, one of which was figured by Lonsdale, *op. cit.* pl. v. fig. 27.

D. 4544. Four fragments of the same, showing internal structure.

D. 2007. A large, much branched zoarium; but with external characters imperfectly shown. Atherfield Clay. East of Ladder, Shanklin. Caleb Evans Coll. Figd. Pl. XI. Fig. 14.

D. 3145. A large tufted zoarium. Lower Greensand. Shanklin. M. Norman Coll.

3. **Meliceritites semiclausa** (Michelin), 1845.

SYNONYMY.

Pustulopora semiclausa, Michelin, 1845. Icon. Zooph. p. 211, pl. liii. fig. 3.
Entalophora ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 176.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 618, figs. 6–10.
non Melicertites ,, d'Orbigny, 1853. *Ibid.* p. 619, pl. 736, fig. 16.
non ,, ,, Waters, 1891. Chilost. Char.: Ann. Mag. Nat. Hist. ser. 6, vol. viii. p. 52, pl. vi. figs. 1, 8.
,, ,, *pars*, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 751.
,, ,, *pars*, Pergens, 1890. Revision, pp. 394, 395.
Vincularia lorieri, d'Orbigny, 1851. Bry. Crét. pl. 601, figs. 18–20.
Meliceritites ,, d'Orbigny, 1853. *Ibid.* p. 621.
,, *cenomana* (*non* d'Orb.), Waters, 1891. *Op. cit.* p. 49, pl. vi. fig. 3.

DIAGNOSIS.

Zoarium rising from a flat, discoid base. The branches are long and thin; they dichotomize repeatedly, and the sub-branches may anastomose. The branches end bluntly. There are from ten to twelve zoœcia in one circuit of the branch.

Zoœcia are hexagonal at their distal ends; the front wall below the aperture is depressed and punctate, and may be pierced by a suboral pore.

Apertures small and circular, or slightly flattened on the lower margin. The peristomial ring is complete and slightly raised. The apertures are arranged in a spiral, which in places becomes irregular. The successive whorls of the spiral are fairly wide apart.

Avicularian zoœcia slightly larger than the normal zoœcia; the aperture is at the lower margin of a deep concavity. The avicularia are few and widely scattered.

Closed zoœcia numerous.

DIMENSIONS.

	B.M., D. 4523.	B.M., D. 7093.
Diameter of branch	1–1·5 mm. ...	2 mm.
Diameter of zoœcia	·2–·3 ,, ...	·3 ,,
Diameter of aperture	·1–·15 ,, ...	·16–·2 ,,

DISTRIBUTION.

ENGLAND:

Upper Greensand: Warminster.

FOREIGN:

Cenomanian: Le Mans and St. Calais, Sarthe; Essen.

FIGURES.

Pl. XIV. Fig. 1*a*, a zoarium, nat. size. Fig. 1*b*, the distal end of a branch of the same, × 10 dia. Fig. 1*c*, the zoœcia on the lower part of a branch of the same, with one zoœcium closed by a sieve-like plate, × 10 dia. Fig. 1*d*, part of the base of the same zoarium, × 10 dia. Cenomanian: Le Mans, Sarthe. Tesson Coll. **D. 4521.**

Pl. XIV. Fig. 2. Branch of a zoarium with an avicularium (*a*), × 14 dia. Cenomanian: Le Mans, Sarthe. Tesson Coll. **D. 4523.**

Pl. XIV. Fig. 3. Part of a worn branch, × 10 dia. Upper Greensand: Warminster. Cunnington Coll. **60,539.**

Fig. 39. Part of a zoarium, × 18 dia. Cenomanian: Essen. Old Coll. **D. 7093.**

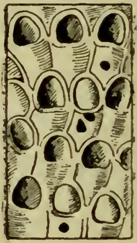

Fig. 39.—*Melicertitites semiclausa* (Mich.).

AFFINITIES.

The synonymy of this species is a little complex, for on the basis of zoœcial measurements M. Pergens has excluded from it the specimens referred to it by d'Orbigny, and included in it some specimens with large apertures from a higher horizon. M. Canu has followed Pergens' lead.

But this proposal is based on an inversion of the characters in the two species, viz., the attribution to *M. semiclausa* of larger apertures than those of *M. gracilis*, in which Pergens and Canu include the *M. semiclausa* of d'Orbigny. Thus Pergens states the width of the aperture in *M. semiclausa* (Mich.) as ·22 mm. and in *M. gracilis* as ·12 mm. But that Michelin's *gracilis* (i.e. *cenomana*, Orb.) had larger apertures than his *semiclausa* is clearly stated in his diagnosis: thus of the former he says: "ostiolis approximatis, ovatis, majusculis, partim diaphragmate divisis"; *M. semiclausa*, on the contrary, he describes as "ostiolis, minimis, rotundis, saepe obstructis, in lineas circulares, distantes, prominulas dispositis." Michelin's figures are in agreement with his text, and specimens in the Tesson Collection show that the characters occur as defined.

The *M. cenomana*, Orb., is the Cenomanian form of *M. semiluna*, and *M. semiclausa* is probably the Cenomanian form of *M. undata*. The separation of the two Cenomanian forms does not seem practicable on measurements alone: thus, whereas Pergens states that the width of the aperture in *M. gracilis* is ·12 mm., Canu raises this figure to ·13 mm.; in the best specimen in the British Museum from the type locality it is ·16 mm.; and in a figure by Waters, which Canu includes in *M. gracilis*, the apertures vary from ·13 to ·18 mm.

LIST OF SPECIMENS.

British.

60,539. A much branched, worn zoarium. Upper Greensand. Warminster. Cunnington Coll. Figd. Pl. XIV. Fig. 3.

Foreign.

D. 3696. Seven branched zoaria. Cenomanian: Craie chloritée. Le Mans, Sarthe. Tesson Coll.

D. 4521. A zoarium with basal disk (on slide). Cenomanian: Craie chloritée. Le Mans, Sarthe. Figd. Pl. XIV. Figs. 1*a–d*.

D. 4522. A zoarium of long, anastomosing branches: the zoœcia in places are worn, and occur in the condition of Michelin's original figure. Cenomanian: Craie chloritée. Le Mans, Sarthe. Tesson Coll.

D. 4523. Three fragments (on slide), showing well-preserved zoœcial structure. Cenomanian: Craie chloritée. Le Mans, Sarthe. Tesson Coll. Figd. Pl. XIV. Fig. 2.

D. 7093. A branched fragment with a few complete zoœcia (on slide). Cenomanian: Essen Grünsand. Essen-am-Ruhr. Old Coll. Figd. No. 39, p. 330.

D. 3695. Seven zoaria. Cenomanian. Le Mans. Tesson Coll.

D. 7092. A branched zoarium (in tube). Cenomanian. Le Mans. Tesson Coll.

4. **Meliceritites cenomana** (d'Orbigny), 1850.

Synonymy.

Pustulopora gracilis (*non* Goldf.), Michelin, 1845. Icon. Zooph. p. 210, pl. liii. fig. 2.
,, ,, d'Archiac, 1846. Crét. vers. Plat. centr.: Mém. Soc. géol. Fr. ser. 2, vol. ii. p. 78.
,, *cenomana*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 184.
Melicertites ,, d'Orbigny, 1853. Bry. Crét. p. 617.
Meliceritites geinitzi, von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 121, pl. xxix. fig. 17; pl. xxx. fig. 1.
,, *semiclausa*, Waters, 1891. Chil. Char.: Ann. Mag. Nat. Hist. ser. 6, vol. viii. p. 52, pl. vi. figs. 1, 8.
,, *docens*, Novak, 1877. Bry. böhm. Kr.: Denk. Akad. Wiss. Wien. vol. xxxvii. pt. 2, p. 110, pl. viii. figs. 13–20.
,, ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 30, pl. iv. fig. 25.

DIAGNOSIS.

Zoarium of thin, dichotomous branches, with blunt-pointed ends.

Apertures in transverse or spiral rows. The apertures are crowded, large, and semicircular. They are larger than the small triangular front wall.

Avicularia between twice and thrice the superficial length of the zoœcia. Depression long, narrow, with expanded distal end.

DISTRIBUTION.

Cenomanian: Le Mans; Kank and Jiné, in Korycaner Schichten.

AFFINITIES.

This species was first figured by Michelin as *Pustulopora gracilis*, Goldf. D'Orbigny recognized this identification as erroneous, and in 1850 renamed the species *Ceriopora cenomana*; in 1853 he transferred it to *Melicerítites*.

This species differs from its two contemporaries, *M. gracilis* (Goldf.) and *M. semiclausa* (Mich.), by its larger and more crowded apertures (*vide* p. 329).

One of Novak's figures of his *M. docens* (viz., *op. cit.* pl. viii. fig. 18) is in the Ceid condition.

The name *Meliceritites cenomana*, Orb., has been differently used by Pergens, who applied it to a species founded in 1851, and renamed *M. vendinnensis* in 1854.[1]

LIST OF SPECIMENS.

D. 3697. Three fragments (in tube). Cenomanian. Le Mans. Tesson Coll.

D. 3621. Two fragments (on slide). Cenomanian. ? Le Mans. Purchased 1877.

D. 2730. Three worn fragments (on slide). Cenomanian. Le Mans. Vine Coll.

5. **Meliceritites roemeri** (von Hagenow), 1839.

SYNONYMY.

Ceriopora roemeri,		von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 285, pl. v. fig. 7.
Meliceritites	,,	Römer, 1840. Verst. nordd. Kr. p. 18.
,,	,,	d'Orbigny, 1853. Bry. Crét. p. 618.

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[1] Bry. Crét. p. 1106.

Vaginopora roemeri, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 602, pl. xxiii. *b*, fig. 20.
Escharites ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
,, (*Meliceritites*) *roemeri*, von Hagenow, 1851. Bry. Maastr. Kr. p. 56.
,, *roemeri*, Kade, 1852. Los. Verst. Schanzenb. p. 30.
,, *porosa*, Römer, 1840. Verst. nordd. Kr. p. 18, pl. v. fig. 12.
Vaginopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 602.
Escharites ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
? ,, *labiata*, Römer, 1840. Verst. nordd. Kr. p. 17, pl. v. fig. 10 (*non* fig. 9 as in text).
? *Vaginopora* ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 602.
? *Escharites* ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
Ceriopora velata, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 285, pl. v. fig. 6.
Escharites ,, Römer, 1840. Verst. nordd. Kr. p. 17.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 56.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 30.
Vaginopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 600, pl. xxiii. *b*, fig. 19.
Filicea ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 46, pl. iv. fig. 7.
,, ,, Pergens, 1890. Revision, p. 389.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 209.
Pustulopora (*Ceriopora*) *gracilis*, Römer, 1840. Verst. nordd. Kr. p. 22.
Escharites gracilis (*non* Goldf.), von Hagenow, 1851. Bry. Maastr. Kr. p. 56, pl. i. fig. 15.
Melicertites ,, (*non* Goldf.), Hamm, 1881. Bry. mastr. Ob.-Sen. p. 46.
,, ,, (*non* Goldf.), Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 46, pl. iv. fig. 8.
,, ,, *pars*, Pergens, 1890. Revision, p. 394.
,, ,, *pars*, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 211.
Pustulopora verrucosa, Römer, 1840. Verst. nordd. Kr. p. 22, pl. v. fig. 24.
Ceriopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 598.
Filicea regularis, d'Orbigny, 1853–4. Bry. Crét. p. 1001, pl. 786, figs. 1–4.
,, *subcompressa*, d'Orbigny, 1853–4. *Ibid.* p. 1001, pl. 786, figs. 5–7.
? ,, *rhomboidalis*, d'Orbigny, 1853–4. *Ibid.* p. 1002, pl. 786, figs. 8–10.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 210.
Laterocea simplex, Pergens, 1893. *Ibid.* p. 1004, pl. 786, figs. 14–16.
Filicea ,, Pergens, 1890. Revision, p. 390.
,, ,, Pergens, 1893. *Op. cit.* p. 210.

DIAGNOSIS.

Zoarium of stout branches, with a thick central axis of the fine proximal, tubular portions of the zoœcia which end distally in large, expanded cells. The branching is dichotomous, and the branches end bluntly.

Apertures quincuncial or in transverse rows. The apertures in well-preserved specimens are semi-elliptical, the lower edge being straight. The peristomes are well raised. In worn specimens the apertures are larger and oval.

Avicularia: the avicularian zoœcia are as large as the normal zoœcia. The aperture is a long, thin slit, expanded into a triangular pore below.

Tubercles frequently present above the avicularian aperture.

DIMENSIONS.

	Fide Pergens.
Diameter of zoœcia	·22–·26 mm.
Diameter of aperture	·12 × ·12–·14 ,,

DISTRIBUTION.

FOREIGN:

Senonian—Maastrichtian: Maastricht; Petit Lanaye; Fauquemont; Meudon; Royan, Charente-Inférieure.
Campanian: Rügen; Gehrden.
Santonian: Saintes.
Coniacian: Lavardin, Les Roches, Vendôme, etc., Loir-et-Cher; St. Paterne, La Ribochère, Tours, and Saint-Christophe, Indre-et-Loire.
Turonian—Angoumian: Merpins and Moutier, Charente.

LIST OF SPECIMENS.

D. 1282. Two fragments (on slide). Maastrichter Kreide. Petit Lanaye. Vine Coll.

D. 3571. A worn, branched specimen (on slide). Maastrichter Kalk. Maastricht. Van Breda Coll.

D. 3718. Two branches (in tube). Maastrichter Kreide. Maastricht. Gamble Coll.

D. 3399. Three fragments (on slide). The specimens have been cut transversely and longitudinally, showing the central axis and peripheral zone of broad zoœcial chambers. Maastrichter Kreide. Maastricht. Van Breda Coll.

?**D. 3398.** Three worn branches (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 4461. Four fragments in the condition *verrucosa.* Quadratenkreide. Gehrden, Hannover.

D. 3400. Twelve worn fragments. Maastrichter Kreide. Maastricht. Van Breda Coll.

?**D. 3729.** Two fragments determined as *Filicea velata* by M. Pergens. 'Senonian.' St. Paterne, Indre-et-Loire. Gamble Coll.

D. 6284, D. 6290. Fragments in the *verrucosa* condition. Mucronatenkreide. Rügen. Laur Coll.

D. 6286, D. 6292. Two specimens (on slides). Mucronatenkreide. Rügen. Laur Coll.

6. Meliceritites lonsdalei, nov.

SYNONYMY.

Pustulopora pustulosa (*non* Goldf.), Lonsdale, 1850. In Dixon, Geol. Suss. p. 288, pl. xviii. A, figs. 8, 8*a*–*g*, *non* fig. 8*h*.

DIAGNOSIS.

Zoarium of dichotomous branches from 1·5 to 2 mm. in diameter. About ten or twelve zoœcia in a circuit of the stem.

Apertures subspiral in arrangement in some places, but in others quite irregular. Apertures fairly raised, circular, or subtriangular or subtrigonal.

Avicularia spatulate, and twice or thrice the length of the ordinary zoœcia.

DIMENSIONS.

Diameter of branch	1·7	mm.
Diameter of zoœcia	·3–·35	,,
Diameter of aperture	·2	,,
External length of avicularium	1·2	,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Croydon; Salisbury; Gravesend. Zone of *Actinocamax quadratus*, Britford and East Harnham.

Middle Chalk: Chatham.

Chalk: Dover; Wiltshire; Sussex.

FOREIGN:

Senonian—Maastrichtian: Maastricht.

FIGURES.

Pl. XV. Fig. 7. One of Lonsdale's type-specimens, × 10 dia. Figd. Dixon, Geol. Suss. pl. xviii. A, fig. 8*g*. Upper Chalk: Sussex. **B. 4491.**

Pl. XV. Fig. 9. Lower part of a branch, × 11 dia. The figure shows part of the specimen figured by Lonsdale, *op. cit.* fig. 8*d*. Chalk: Sussex. **60,344.**

Pl. XV. Fig. 5. A thin branch bearing both gonocyst and avicularia, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4204.**

Pl. XV. Fig. 6. A zoarium with the basal avicularia occurring on projecting spines. Fig. 6*a*, the whole zoarium, nat. size. Fig. 6*b*, part of a branch, with spatulate, lateral avicularia; × 10 dia. Fig. 6*c*, a basal avicularium on a lateral spine. Chalk: Wiltshire. Presented by the late P. B. Brodie. **D. 2298.**

Pl. XV. Fig. 8. Part of the base of a zoarium, on an echinid fragment; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4257.**

AFFINITIES.

This Bryozoan was first figured by Lonsdale, who identified it as *Pustulopora pustulosa*, Blv. Lonsdale gave a series of figures, one of which (fig. 8*g*) showed the avicularia; but the figure was unsatisfactory, and has been overlooked: the specimen is accordingly refigured on Pl. XV. Fig. 7. In Lonsdale's description of the species is a clear account of them. "Connected with some apertures," he says, "was a long channel which ranged upwards along the surface of the branch, and was bounded on each side by a ridge. No case of an outer covering was observed, but as the channels occupied the position of ovarian capsules it was conjectured that they might have performed the functions of these vesicles." (Dixon, Geol. Suss. p. 290.)

The nearest ally of this species is *Meliceritites dollfusi*, Perg., which differs by the greater regularity in the arrangement of the peristomes, which are Spiroporiform.

LIST OF SPECIMENS.

D. 4204.	Two fragments (on slide). The larger specimen shows both a gonocyst and the spatulate avicularium. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XV. Fig. 5.
D. 2298.	A large zoarium of var. *dollfusi* with the base (in chalk); the avicularia on the lower part of the branch project as lateral spines. Upper Chalk. Wiltshire. Brodie Coll. Figd. Pl. XV. Fig. 6.
B. 4491.	The type of Lonsdale's *Pustulopora pustulosa*, de Blainv.? &-Mich. Upper Chalk. Sussex. Dixon Coll. Figd. Lonsdale, Dixon, Geol. Suss. 1850, pl. xviii. A, fig. 8*g*; and Pl. XV. Fig. 7.
D. 4257.	Base attached to echinid fragment. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XV. Fig. 8.

60,344. A well-preserved branch, showing transverse section. Chalk. Sussex. Figd. Lonsdale, *op. cit.* fig. 8*d*. Dixon Coll. Figd. Pl. XV. Fig. 9.

D. 4489. A fragment of a branch. Chalk. Sussex. Figd. Lonsdale, *op. cit.* 1850, pl. xviii. A, fig. 8*a*.

D. 4490. A fragment of a branch showing vertical section. Chalk. Sussex. Figd. Lonsdale, *op. cit.* fig. 8*f*.

D. 484. A long branch. Middle Chalk. Chatham. Gamble Coll.

D. 624. Three specimens on slide: 1 and 2 = *M. lonsdalei*; 3 = *Nodelea durobrivensis*, Greg. Middle Chalk. Chatham. Vine Coll., No. 101.

D. 627. Two fragments. Middle Chalk. Chatham. Vine Coll., No. 105.

D. 726. Base attached to echinid fragment. Middle Chalk. Chatham. Vine Coll.

D. 2630. A long branch (on slide). Upper Chalk. Salisbury. Vine Coll.

D. 3087. A large, much branched zoarium (in chalk). In part the apertures are worn down and are then circular, and the branch resembles *Entalophora macropora*, Orb. Chalk. Dover. Bowerbank Coll.

D. 3117. Two branches 2·5 mm. in dia., and partly worn as in Goldfuss' figure of *M. gracilis*. (On chalk.) Chalk. Dover. Old Coll.

D. 3990. Three fragments in especially good preservation (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4100. A branch of the irregular variety, with secondary pores. Middle Chalk. Chatham. Gamble Coll.

D. 4331. A branch 3 mm. in dia., with about sixteen apertures in a complete circle. Upper Chalk: zone of *Actinocamax quadratus*. Britford. Gamble Coll.

D. 4336. A fragment of a branch. Upper Chalk: zone of *Actinocamax quadratus*. East Harnham, Wilts. Gamble Coll.

D. 4518. A branched fragment. Upper Chalk. Gravesend. Wetherell Coll.

D. 4519. A branch (in flint). Upper Chalk. Croydon. Old Coll.

D. 4528. A small fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4535. A branched fragment. Chalk. S.E. England. Toulmin Smith Coll.

D. 7098. A long branch (on chalk). Middle Chalk. Chatham. Gamble Coll.

FOREIGN.

D. 3303. A short fragment of a branch with avicularia. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3410. A longer branched fragment, with the zoœcia very irregularly arranged. Maastrichter Kreide. Maastricht. Van Breda Coll.

7. Meliceritites fistulata, nov.

DIAGNOSIS.

Zoarium of thick, irregular branches, which in places are hollow. Apertures irregularly arranged, with some zones bare of apertures. Avicularia long, spatulate.

DIMENSIONS.

Diameter of branch	... ...	3 mm.
Diameter of zoœcia	... ...	·25 ,,
Diameter of aperture	... ...	·12 ,,
External length of avicularia	... ...	1 ,,

DISTRIBUTION.

Middle Chalk : Chatham.

FIGURES.

Pl. XV. Fig. 10. A zoarium. Fig. 10*a*, the zoarium, nat. size. Fig. 10*b*, part of the zoarium, × 16 dia. Middle Chalk : Chatham. Vine Coll. **D. 625.**

AFFINITIES.

This species is allied by its zoœcial characters to *M. lonsdalei*, but it differs by having bare zones without apertures.

LIST OF SPECIMENS.

D. 625. A branched zoarium (on slide), with a fragment of *M. lonsdalei*, Greg. Middle Chalk. Chatham. Vine Coll. Figd. Pl. XV. Figs. 10*a*, *b*.

D. 4538. A zoarium with an attached *Spinopora dixoni*. Chalk. S.E. England. Toulmin Smith Coll.

D. 4539. A fragment of a zoarium. Chalk. S.E. England. Toulmin Smith Coll.

8. **Meliceritites propinqua** (Marsson), 1887.

SYNONYMY.

Nodelea propinqua, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 47, pl. v. fig. 1.

DIAGNOSIS.

Zoarium of rather thick branches. No granules present.

Zoœcia externally are hexagonal or rhomboidal.

Apertures subcircular. Peristomes well raised ; subspiral or irregular in arrangement.

Avicularia twice to twice and a half as long as normal zoœcia, with very elongated, narrow aperture.

DIMENSIONS.

	B.M., D. 4520.
Diameter of branch	1·7 mm.
Diameter of zoœcia	·4 ,,
Diameter of aperture	·15–·2 ,,
External length of avicularium	1·5 ,,

DISTRIBUTION.

BRITISH :
Upper Chalk : Dover.
Middle Chalk : Chatham.

FOREIGN :
Senonian—Campanian : Rügen.

FIGURES.

Pl. XVI. Fig. 1. Part of a zoarium with a spatulate avicularium, × 28 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4116.**

Pl. XVI. Fig. 2. Part of a zoarium with a longer avicularium, × 14 dia. Chalk: Dover. Bowerbank Coll. **D. 4520.**

AFFINITIES.

This Bryozoan has the aspect that would be presented by thick specimens of *M. lonsdalei* so weathered that the peristomes have been lowered and the interzoœcial sutures rendered prominent. The branches, however, are thicker, the avicularia longer, and the apertures slightly more distant than in *M. lonsdalei*.

In the hexagonal form of the zoœcia it resembles *M. ornata* (Orb.), but that 'species' has the peristome depressed below the general surface of the zoarium, and not raised above it, and has tubercles.

By the thickness of the branches and their blunt terminations *M. propinqua* approaches *M. gracilis*; but it differs by the absence of tubercles, and the tubular, subcircular peristomes.

LIST OF SPECIMENS.

BRITISH.

D. 4520. Several branches on a block of chalk. Upper Chalk. Dover. Bowerbank Coll. Figd. Pl. XVI. Fig. 2.

D. 4116. A specimen (on flint). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVI. Fig. 1.

FOREIGN.

D. 6314. A fragment (on slide). Senonian: Mucronatenkreide. Rügen. Laur Coll.

D. 6315. A fragment (on slide). Senonian: Mucronatenkreide. Rügen. Laur Coll.

9. Meliceritites parviarmata, nov.

DIAGNOSIS.

Zoarium of thin branches.

Zoœcia hexagonal, separated by raised vertical ridges. Apertures circular, or with a straight lower margin, arranged in regular, fairly distant verticels.

Avicularia or vibracula numerous, but small: they are rhomboidal in shape, and occur at the angles between the zoœcia. Avicularian apertures small, circular, or elliptical.

DIMENSIONS.

Diameter of branch	1·2	mm.
Diameter of zoœcia	·26	,,
Diameter of aperture	·1–·12	,,
External length of zoœcia	·5	,,
External length of avicularia	·2	,,

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURE.

Pl. XV. Fig. 1. A branch, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4529.**

AFFINITIES.

This species is characterized by the absence of the long spatulate avicularia; they are replaced by numerous rhomboidal zoœcia, which may be avicularia or, more probably, vibracula. By the characters of its normal zoœcia it is allied to *M. undata.*

D. 4529. A branch (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XV. Fig. 1.

10. Meliceritites undata, d'Orbigny, 1853.

SYNONYMY.

Meliceritites undata, d'Orbigny, 1853. Bry. Crét. p. 625, pl. 737, figs. 11–14.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
,, *francqi*, d'Orbigny, 1853. Bry. Crét. p. 626, pl. 737, figs. 15, 16.

DIAGNOSIS.

Zoarium of thin (1 – 1·5 mm.), dichotomous branches. Zoœcia hexagonal or lozenge-shaped, with raised borders.

Apertures in regular, transverse rows; triangular, with rounded angles.

Avicularia twice as long as the zoœcia, with long, triangular apertures.

Closed zoœcia numerous; the cap is sometimes biporous.

DIMENSIONS.

Diameter of branch	1·5 mm.
Diameter of zoœcia	·33 ,,
Diameter of aperture	·17 ,,

DISTRIBUTION.

BRITISH:

Upper Chalk: Gravesend; Beachy Head.
Middle Chalk: Chatham.

FOREIGN:

Senonian: Carancy, Pas-de-Calais; south of Les Roches, Loir-et-Cher.
Turonian or Coniacian: Lavardin, Loir-et-Cher.

FIGURES.

Pl. XVI. Fig. 3. Distal end of a branch, partly in the Ceid condition, with avicularium; × 16 dia. Middle Chalk: Chatham. Gamble Coll. **D. 3995.**

Pl. XV. Fig. 2. Part of a zoarium (possibly of this species), with a closed zoœcium, and a notched aperture (? an inverted avicularium). Upper Chalk: Gravesend. Vine Coll. **D. 630.**

Pl. XV. Fig. 3. Part of a worn zoarium, × 18 dia. Upper Chalk: Beachy Head. **D. 7107.**

Pl. XV. Fig. 4. Part of another zoarium, × 11 dia. Middle Chalk: Chatham. Gamble Coll. **D. 489.**

LIST OF SPECIMENS.

D. 3995. One branch, and a long thin branch of probably the same species (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVI. Fig. 3.

? D. 630. A small fragment with probably an inverted avicularian aperture. Upper Chalk. Gravesend. Vine Coll. Figd. Pl. XV. Fig. 2.

D. 7107. A worn zoarium with some biporous closed zoœcia and the zoœcia approximating to the Ceid form. Upper Chalk. Beachy Head. Presented by the author. Figd. Pl. XV. Fig. 3.

D. 489. Two fragments (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XV. Fig. 4.

D. 358. A branch on slide with two specimens of *Nodelea durobrivensis*, Greg. Middle Chalk. Chatham. Gamble Coll.

D. 4531. A thin branch. Middle Chalk. Chatham. Gamble Coll.

D. 4537. An irregular branch, of which some zones have hexagonal zoœcia of the *undata* type, but in places it has the apertures crowded and approximates to the *lonsdalei* type. Chalk. S.E. England. Toulmin Smith Coll.

D. 626. A branch with lozenge-shaped and sub-hexagonal zoœcia (on slide). Middle Chalk. Chatham. Vine Coll.

D. 356. A branched fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4342. A branched fragment, in hollow flint. Middle Chalk. Chatham. Gamble Coll.

11. **Meliceritites ornata** (d'Orbigny), 1853.

Synonymy.

Nodelea ornata, d'Orbigny, 1853. Bry. Crét. p. 612, pl. 735, figs. 12–16.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
,, ,, Waters, 1891. Chil. Char.: Ann. Mag. Nat. Hist. ser. 6, vol. viii. pl. vi. fig. 10.
Meliceritites ,, Pergens, 1890. Revision, p. 395.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii., Pr. Vb. p. 138.
,, ,, Pergens, 1895. Bry. Cachemb.: *ibid.* p. 182.
Nodelea pulchella, d'Orbigny, 1853. Bry. Crét. p. 613, pl. 736, figs. 1–4.
,, *transversa*, d'Orbigny, 1853. Bry. Crét. p. 613, pl. 736, figs. 5–8.
,, ,, Waters, 1891. *Op. cit.* pl. vi. fig. 9.

Diagnosis.

Zoarium of dichotomous branches. Zoœcia hexagonal, and often bounded by a ridge, with tubercles at some of the angles. Aperture semicircular. Avicularia short, with trigonal aperture, contracting to a slit at the upper end.

Distribution.

Senonian—Coniacian: Tours and Joué, Indre-et-Loire, in Craie de Villedieu; Vendôme and Villardin, Loir-et-Cher; Bougniaux, Charente-Inférieure.

D. 4797. No. 4 on a slide containing six bryozoa. Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

12. **Meliceritites semiluna,** d'Orbigny, 1853.

SYNONYMY.

Meliceritites semiluna, d'Orbigny, 1853. Bry. Crét. p. 623, pl. 736, figs. 20, 21.
,, *semiclausa, pars*, Pergens, 1890. Revision, p. 394.
,, ,, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 751.

DIAGNOSIS.

Zoarium of thick, dichotomous branches.

Apertures very large, round above, with a straight lower margin. Front wall a narrow triangular area, much smaller than the aperture.

Avicularia twice as long as the zoœcia.

DISTRIBUTION.

BRITISH:
Middle Chalk: Chatham.
FOREIGN:
Senonian—Coniacian: Tours and Joué, Indre-et-Loire; Bougniaux and Péguillac, Charente-Inférieure.
Turonian: Villardin, Loir-et-Cher.

FIGURE.

No. 40. Part of a branch with avicularium, × 20 dia. Middle Chalk: Chatham. Gamble Coll. **D. 358.**

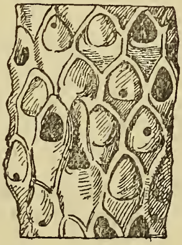

FIG. 40.—*Meliceritites semiluna*, Orb.

AFFINITIES.

This species is the Senonian representative of *M. vendinnensis.* It is characterized by its large aperture and small trigonal front wall. The species differs from *M. vendinnensis* by its long spatulate avicularium.

LIST OF SPECIMENS.

British.

D. 358. A branch on slide with fragment of *Nodelca durobrivensis.* Middle Chalk. Chatham. Gamble Coll. Figd. No. 40.

Foreign.

D. 4817. Three fragments (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

13. **Meliceritites dollfusi,** Pergens, 1890.

Synonymy.

Meliceritites dollfusi, Pergens, 1890. Revision, p. 395, pl. xiii. fig. 4.
? *Entalophora meudonensis,* d'Orbigny, 1851. Bry. Crét. pl. 623, figs. 8–10.
Meliceritites „ (*ex. syn.*), d'Orbigny, 1853. *Ibid.* p. 622.
non „ „ Staring, 1860. Bod. Nederl. vol. ii. p. 396.

Diagnosis.

Zoarium of branches, about 2 mm. in diameter, which divide dichotomously. The branches are formed of longitudinal series, each containing about a dozen zoœcia.

Apertures well raised, subcircular to subtrigonal. Arranged in regular whorls or spirals, but irregular in places. Peristomes well raised.

Avicularian zoœcia twice as long as the normal zoœcia. The depression for the mandible is spatulate and narrow in the middle.

Dimensions.

	Fide Pergens.
Diameter of branch	1·5–2 mm.
Diameter of zoœcia	·3–·34 „
Diameter of aperture	·12–·14 × ·18 „
Length of avicularium	·64 „

Distribution.

Senonian—Maastrichtian: Meudon; Royan.
Santonian: Saintes, etc., Charente-Inférieure.
Coniacian: Vendôme, Lisle, etc., Loir-et-Cher; Tours and Joué, Indre-et-Loire.
Turonian—Angoumian: Merpins, Charente; Villardin and St. Rimay, Loir-et-Cher.

Affinities.

The *Meliceritites meudonensis* (Orb.) appears to be the worn condition of *M. dollfusi,* in which the apertures have become more triangular owing to the lowering of the peristomes. Pergens, however (Revision, p. 396), treats *M. meudonensis* as identical with *M. ogivalis*. But *M. ogivalis* has only eight instead of twelve zoœcia in a circuit of the stem; it has depressed instead of raised peristomes; its longitudinal series of apertures are more crowded, and below each aperture is a well-developed tubercle. But owing to the uncertainty regarding *M. meudonensis*, it is advisable to adopt the name proposed by Pergens, after the author of the admirable annual records of Bryozoan literature.

D. 4809. A branched fragment (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4934. A branched fragment. Turonian. St. Rimay, Loir-et-Cher. Purchased 1898.

14. **Meliceritites ?distans** (von Hagenow), 1851.

Synonymy.

Escharites distans, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
,, ,, *pars*, von Hagenow, 1851. Bry. Maastr. Kr. p. 16, pl. i. figs. 16*e*, *f*; *non g*, *h*, *i*, ? *a-d*, *k-m*, and *non* fig. 17.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 30.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 29.
,, ,, *pars*, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. mal. Belge, vol. xxi., Mém. p. 206.
,, ,, Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 205.
Filicea marssoni, Pergens, 1894. Bry. Limb.: Bull. Soc. belge Géol. vol. vii. p. 179, pl. ix. figs. 4, 5.

Diagnosis.

Zoarium of thin branches, with the zoœcia in spiral series of from three to four rows each.

Apertures in worn zoœcia, lozenge-shaped and closely crowded. In zoœcia with complete front wall, the apertures are small, with a straight lower margin, and occur at the summit of a lozenge-shaped area.

Dimensions.

Diameter of branch	1·5 mm.
Diameter of zoœcia	·3–·4 ,,
Diameter of aperture	·10–·12 ,,

Distribution.

? Danian: Faxoe.
Senonian — Maastrichtian: Maastricht; Geulem; Mt. St. Pierre; Petit Lanaye; Ciply; Fauquemont.

FIGURE.

No. 41. Part of a zoarium showing the zoœcia with small apertures and large front walls, × 5 dia. Senonian—Maastrichtian: Ciply. Hottalert Coll. **30,739.**

LIST OF SPECIMENS.

30,739.	A branched zoarium (in tube). Maastrichtian: Tuffeau de Ciply. Ciply. Hottalert Coll. Figd. No. 41.
D. 6333.	A series of fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.
? **D. 6334.**	An irregular branch (on slide). Maastrichter Kreide. Maastricht. Busk Coll.
D. 1367.	Three worn fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.
D. 1281.	A worn fragment (on slide). Maastrichter Kreide. Petit Lanaye. Vine Coll.
D. 3722.	Three fragments of form *Filicea marssoni* (in tube). Maastrichter Kreide. Maastricht. Gamble Coll.

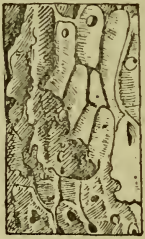

FIG. 41.—*Meliceritites ?distans* (Hag.).

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **angulosa** (d'Orbigny), 1853.

SYN. *Nodelea angulosa*, d'Orbigny, 1853. Bry. Crét. p. 610, pl. 735, figs. 4–8.
Meliceritites gracilis (*non* Goldf.), Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 46, pl. iv. fig. 8.
,, ,, *pars*, Pergens, 1890. Revision, p. 394.

CHAR.—Zoarium of dichotomous, cylindrical branches of medium diameter. Zoœcia rhomboidal. Apertures triangular, in transverse rows; crowded. Avicularia four times as large as the normal zoœcia: aperture hastate.

DISTRIB.—Senonian—Maastrichtian: Sainte-Colombe, Manche.
Campanian: Rügen.

AFF.—Differs from *M. gracilis* by the form of the apertures in both zoœcia and avicularia. The avicularian apertures in the Rügen specimen figured by Marsson are of the same shape, but smaller size than in that of d'Orbigny.

2. **compressa,** d'Orbigny, 1853.

Meliceritites compressa, d'Orbigny, 1853. Bry. Crét. p. 620, pl. 736, figs. 17–19.
,, ,, *pars,* Pergens, 1890. Revision, p. 394.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 507.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 212.
,, ,, Pergens, 1895. Bry. Arche de Lèves: *ibid.* vol. viii., Pr. Vb. p. 138.
,, ,, Pergens, 1895. Bry. Cachemb.: *ibid.* p. 182.
,, ,, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 154.

Char.—Zoarium of thin, cylindrical, dichotomous stems. Apertures triangular, in transverse rows containing about fifteen in circumference of stem. Peristome complete; fairly prominent. Zoœcia not bordered by ridges. Avicularia?

Distrib.—Cenomanian: Villers and Honfleur, Calvados; Cap de la Hève, Seine-Inférieure; Janières, Sarthe.

Aff.—The zoœcial characters resemble those of d'Orbigny's figure of *M. foricula.*

3. ? **haimei** (d'Orbigny), 1851.

Syn. *Entalophora haimei,* d'Orbigny, 1851. Bry. Crét. pl. 617, figs. 11, 14.
Meliceritites ,, d'Orbigny, 1853. *Ibid.* p. 618.
,, ,, Pergens, 1890. Revision, p. 399.

Char.—Zoarium of cylindrical, dichotomous branches. Zoœcia in distant whorls, and externally elongate and hexagonal. Avicularia?

Distrib.—Albian: Grandpré, Ardennes.

Aff.—Pergens states that the type is worn. The generic affinities are doubtful.

4 ? **hisingeri** (von Hagenow), 1846. (Name only.)

Syn. *Vaginopora hisingeri,* von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 602.
Escharites ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.

Distrib.—Senonian—Campanian: Rügen.

5. **incrustata** (Römer), 1840.

Syn. *Escharites incrustata,* Römer, 1840. Verst. nordd. Kr. p. 17, pl. v. fig. 8 (*non* fig. 10 as in text).
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
Vaginopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 600.

Char.—Zoarium of cylindrical, dichotomous branches: the figured specimen is in the Ceid state, so the species is indeterminable.

Distrib.—Senonian—Campanian: Gehrden, Hannover.

Aff.—Possibly worn fragments of *M. nodulosa* (Röm.).

6. ? **irnichensis** (Vogel), 1892.

Syn. *Filicea irnichensis*, Vogel, 1892. Sen. Irnich.: Verh. nat. Ver. preuss. Rheinl. vol. xlix. p. 92, pl. i. fig. 22.

Char.—Worn, indeterminable, cylindrical, dichotomous branches.

Distrib.—Upper Senonian: Irnich, Eifel.

7. **nodulosa** (Römer), 1840.

Syn. *Escharites nodulosa*, Römer, 1840. Verst. nordd. Kr. p. 17, pl. v. fig. 9 (*non* 8 as in text).
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
Vaginopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 602.

Char.—Zoarium of cylindrical, dichotomous branches. Zoœcia hexagonal. Aperture trigonal, transversely elongated. Tubercles at the angles between the zoœcia.

Distrib.—Senonian—Campanian: Gehrden, Hannover.

8. **obliqua** (d'Orbigny), 1853–4.

Syn. *Filicea obliqua*, d'Orbigny, 1853–4. Bry. Crét. p. 1002, pl. 786, figs. 11–13.
,, ,, Pergens, 1890. Revision, p. 390.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 210.

Char.—Zoarium longitudinally ribbed, with the zoœcia obliquely truncated in the specimen figured by d'Orbigny.

Distrib.—Senonian—Coniacian: Tours, St. Paterne.

Aff.—The species is possibly based on a worn *Petalopora*. It is recorded here, as the rest of the genus is included in *Meliceritites*.

9. ? **rhombifera** (von Hagenow), 1839.

Syn. *Ceriopora rhombifera*, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 284.
Escharites ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
Vaginopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 602.

Char.—Zoarium of thin, cylindrical branches, which are nodulose. Zoœcia rhomboidal. Apparently founded on a stem in the Ceid condition.

Distrib.—Senonian—Campanian: Rügen.

10. **triangularis** (d'Orbigny), 1851.

Syn. *Entalophora triangularis*, d'Orbigny, 1851. Bry. Crét. pl. 625, figs. 1–4.
Melicertites ,, d'Orbigny, 1853. *Ibid.* p. 623.
,, ,, Pergens, 1890. Revision, p. 399.

Char.—Zoarium of stout, cylindrical, dichotomous branches. Zoœcial characters and apertures like those of *M. gracilis*. Avicularia ?

Distrib.—Senonian—Coniacian : Tours.

11. ? **upwarensis**, Keeping, 1883.

Syn. *Melicertites upwarensis*, Keeping, 1883. Foss. Neoc. Upware, p. 138, pl. vii. fig. 13.

Char.—A thick, irregular, much branched zoarium, of which the family and genus cannot be determined from the description and figures.

Distrib.—Aptian : Upware, Cambridgeshire.

12. **vendinnensis** (d'Orbigny), 1854.

Syn. *Vincularia cenomana*, d'Orbigny, 1850. Nouv. Bry. Crét.: Rev. Mag. Zool. ser. 2, vol. ii. p. 108.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 174.
,, ,, d'Orbigny, 1851. Bry. Crét. p. 60, pl. 600, figs. 8–10.
non Melicertites ,, d'Orbigny, 1853. *Ibid.* p. 617.
Nodelea ,, d'Orbigny, 1853. *Ibid.* p. 609, pl. 761, figs. 11–13.
,, ,, Bucaille, 1890. Bry. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. pp. 507, 511.
Melicertites ,, Pergens, 1890. Revision, p. 394.
,, ,, Canu, 1897. Bry. Jan.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 155.
,, ,, Canu, 1897. Bry. St. Cal.: *ibid.* vol. xxv. p. 752.
,, *vendinnensis*, d'Orbigny, 1854. Bry. Crét. p. 1106.

Char.—Zoarium of thin, cylindrical branches. Apertures quincuncial, with straight lower lip. Peristomes well raised. Beside each aperture is a small tubercle. Avicularia sparsely scattered; twice as large as the normal zoœcia.

Distrib.—Cenomanian : Le Mans, St. Calais, and Janières, Sarthe.

INVERSARIA, von Hagenow, 1851.

[Bry. Maastr. Kr. p. 57.]

Synonyms.

Ceriopora, *pars*, Goldfuss, 1827.
Alveolites, *pars*, de Blainville, 1834.
Multinodelea, d'Orbigny, 1853.
Melicertites, *pars*, Pergens, 1890.
Vaginopora, *pars*, von Hagenow, 1846.
Escharites, *pars*, von Hagenow, 1850.

Diagnosis.

Eleidæ with erect zoarium formed of a central axial bundle surrounded by one or more layers of zoœcia.

Avicularia spatulate.

Type Species.

Ceriopora tubiporacea, Goldfuss, 1827. Maastrichtian: Maastricht.

Affinities.

The members of this genus have the general characters of *Meliceritites*, but differ by the presence of the external lamellæ covering the central axial bundle. Young branches in some species may be indistinguishable from *Meliceritites*; but, as shown in section (Fig. 42), the external lamella in other species is continued to the summit of the branches.

Waters regards the zoœcia of the external lamellæ as growing from a plate which closes the aperture in the subjacent zoœcia; but he adds, "as to the meaning of this extraordinary origin of the new zoœcia I would not attempt an explanation."[1] Whether this "extraordinary" arrangement is of generic value is perhaps doubtful. But until the origin of this arrangement is explained *Inversaria* may be conveniently retained.

1. **Inversaria tubiporacea** (Goldfuss), 1827.

Synonymy.

Ceriopora tubiporacea, Goldfuss, 1827. Petref. Germ. vol. i. p. 35, pl. x. fig. 13.
,, ,, Morren, 1829. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 40.
,, ,, von Hagenow, 1840. Mon. Rüg. pt. ii.: N. Jahrb. 1840, p. 647.
,, ,, von Reuss, 1846. Verst. böhm. Kr. p. 63.
,, ,, *pars*, Giebel, 1848. Planerm. Quedlinb.: Zeit. Zool. Zoot. vol. i. p. 17.
Alveolites ,, de Blainville, 1834. Man. Act. p. 405.
Inversaria ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 58, pl. vi. fig. 9.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 396.
,, ,, Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 209.
,, ,, *pars*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 39.
Melicerites ,, Ubaghs, 1879. Géol. Pal. Limb. p. 222.
Ceriopora milleporacea, Goldfuss, 1827. Petref. Germ. vol. i. p. 34, pl. x. fig. 10.

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[1] Waters. Chil. Char. in Melic.: Ann. Mag. Nat. Hist. ser. 6, vol. viii. 1891, p. 52.

Ceriopora	*milleporacea,*	Morren, 1829. Cor. foss. Belg.: Ann. Acc. Groning. 1828, p. 39.
,,	,,	Hisinger, 1837. Leth. Svec. p. 103, pl. xxix. fig. 6.
,,	,,	von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 282.
,,	,,	d'Archiac, 1846. Crét. vers. Plat. contr.: Mém. Soc. géol. Fr. ser. 2, vol. ii. p. 58.
Alveolites	,,	de Blainville, 1834. Man. Act. p. 405.
Vaginopora	,,	von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 602.
Inversaria	,,	von Hagenow, 1851. Bry. Maastr. Kr. p. 58, pl. vi. figs. 10, 11.
,,	,,	Staring, 1860. Bod. Nederl. vol. ii. p. 396.
Melicerites	,,	Ubaghs, 1879. Géol. Pal. Limb. p. 222.
Escharites	*irregularis,*	Römer, 1840. Verst. nordd. Kr. p. 17.

DIAGNOSIS.

Zoarium of stout, cylindrical, dichotomous branches. The central axis consists of a thick bundle of zoœcia, which is surrounded by from one to four laminæ of zoœcia.

Zoœcia irregular, hexagonal, or rhomboid; crowded; apertures small, circular, or elliptical. Avicularia?

DISTRIBUTION.

Senonian—Maastrichtian: Maastricht; St. Pierre.
Campanian: Balsberg and Ignaberg, Sweden.
Santonian: Salzberg, near Quedlinburg.
? Coniacian; near Tours (*fide* d'Archiac).

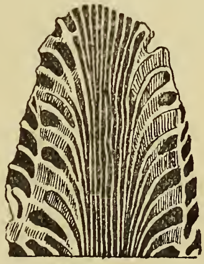

FIG. 42.—*Inversaria tubiporacea* (Goldf.).

FIGURES.

Fig. 42. Longitudinal section through the distal end of a branch of var. *milleporacea*, showing the presence of a unilaminar layer; × 8 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 7097.**

Fig. 43. Sections across the lower part of a branch. Fig. 43*a*, a longitudinal section, with three external layers, × 8 dia. Fig. 43*b*, transverse section, × 9 dia. Maastrichter Kreide: Maastricht. Van Breda Coll. **D. 3393**.

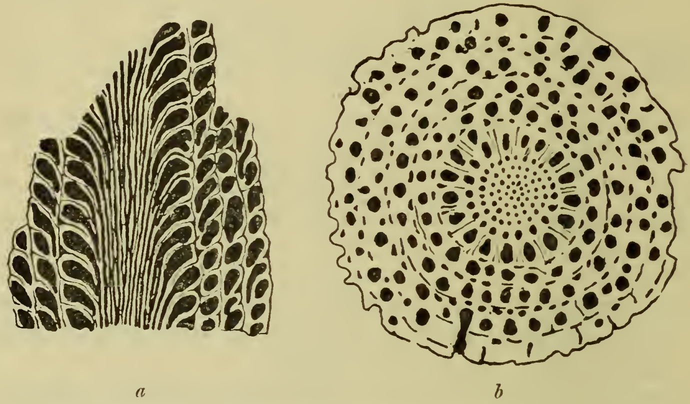

Fig. 43.—*Inversaria tubiporacea* (Goldf.).

Affinities.

This species is common in the Maastricht Chalk, but the specimens are much rolled, and those showing the external characters are very scarce. The shape of the avicularia is unknown. The zoœcial characters resemble those of *Meliceritites distans*. *I. milleporacea* is a variety with thinner branches, and slightly more distant apertures.

LIST OF SPECIMENS.

D. 7097. A branch and longitudinal section of its end. Maastrichter Kreide. Maastricht. Van Breda Coll. Figd. No. 42, p. 351.

D. 3396. A zoarium with longitudinal and transverse sections. Maastrichter Kreide. Maastricht. Van Breda Coll. Figs. 43*a*, *b*.

D. 3395. Nine fragments, some of which include the base. Maastrichter Kreide. Maastricht. Van Breda Coll.

60,154. A series of specimens. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3394. Four thick fragments. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6336. Eight fragments (on slide). Maastrichter Kreide. St. Pierre, Maastricht. Busk Coll.

D. 1359. Two fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 1365. Two fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 6335. Three thick fragments (on slide). Maastrichter Kreide. St. Pierre, Maastricht. Busk Coll.

D. 3320. A specimen of var. *milleporacea.* Maastrichter Kreide. Maastricht. Old Coll.

D. 3401. Eighteen branches of var. *milleporacea* (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6330. Three thick fragments (on slide). Maastrichter Kreide. St. Pierre, Maastricht. Busk Coll.

D. 3413. A branched fragment of var. *milleporacea* (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 7099. A fragment of var. *milleporacea* (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 7100. A fragment of var. *milleporacea* (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3396. A longitudinal section (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

2. Inversaria orbicularis,[1] nov.

DIAGNOSIS.

Zoarium of thick, dichotomous branches, which end bluntly.

Zoœcia hexagonal externally. The sutures raised.

Apertures semicircular, arranged irregularly and obliquely to the main axis of the branch. The proximal portions of the zoœcia are subcircular (not elliptical) in section.

Avicularia triangular, broad at the base, tapering above, with concave sides.

DIMENSIONS.

Diameter of branch	3–4	mm.
Diameter of zoœcia	·25–·3	,,
Diameter of aperture	·17–·2	,,
External length of avicularium	·5–·8	,,

DISTRIBUTION.—Upper Greensand: Warminster, Wilts.

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[1] From the circular shape of worn zoœcia.

Figures.

Pl. XVI. Fig. 4. Fig. 4*b*, part of a branch, × 12 dia. Fig. 4*a*, the whole branch, nat. size. Upper Greensand: Warminster. **D. 3168.**

LIST OF SPECIMENS.

D. 3168. A slide containing a well-preserved fragment of **D. 3167.** Upper Greensand. Warminster. Baker Coll. Figd. Pl. XVI. Figs. 4*a*, *b*.

D. 3167. Two zoaria and slide showing zoœcial characters. Upper Greensand. Warminster. Baker Coll.

D. 3169. A slide with a worn, thick central axis. Upper Greensand. Warminster. Baker Coll.

3. **Inversaria trigonopora**, von Hagenow, 1851.

Synonymy.

Inversaria trigonopora, von Hagenow, 1851. Bry. Maastr. Kr. p. 57, pl. vi. fig. 8.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 396.
Meliceritites ,, Ubaghs, 1879. Géol. Pal. Limb. p. 222.
Inversaria tubiporacea, *pars*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 39.

Diagnosis.

Zoarium of thick, blunt branches. Zoœcia hexagonal. Apertures large, triangular, crowded, and irregularly arranged.

Avicularian apertures slightly longer than those of the zoœcia, with long, spatulate, mandibular depression.

Distribution.

Senonian—Maastrichtian: Maastricht.
Campanian: Rügen.

Affinities.

This species differs from *I. tubiporacea* by the triangular shape and larger size of the apertures.

LIST OF SPECIMENS.

D. 3405. A branched zoarium (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6291. A well-preserved specimen (on slide). Mucronatenkreide. Rügen. Laur Coll.

?**D. 1392.** Two worn fragments identified by Vine (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3424. A worn zoarium (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

4. **Inversaria tuberosa** (d'Orbigny), 1853.

SYNONYMY.

Multinodelea tuberosa,	d'Orbigny, 1853.	Bry. Crét. p. 615, pl. 736, figs. 9–15.
Melicerititcs ,,	Pergens, 1890.	Revision, p. 395.
,, ,,	Pergens, 1893.	Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 212.
,, ,,	Canu, 1897.	Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 751.

DIAGNOSIS.

Zoarium of stout, cylindrical, dichotomous branches, with numerous external laminæ. No tubercles.

Zooœcia externally rhomboidal; not bounded by ridges.

Apertures trigonal, usually smaller than the suboral area. Peristomes slightly raised; usually in regular transverse rows, but locally irregular.

Avicularia numerous; apertures slightly larger than those of the zoœcia; a large mandibular depression.

Closed zoœcia numerous.

DISTRIBUTION.

BRITISH:

Chalk: S.E. England.

FOREIGN:

Senonian—Maastrichtian: Royan.
Santonian: Saintes, etc., Charente-Inférieure.
Coniacian: Sainte-Christophe, Tours, Joué, and St. Paterne, Indre-et-Loire; Villedieu, Loir-et-Cher.
Turonian or Coniacian: Vendôme, Lavardin, Les Roches, etc., Loir-et-Cher.
Turonian—Angoumian: Merpins, Charente; Villardin, Loir-et-Cher.

LIST OF SPECIMENS.

D. 4536. A zoarium (in chalk). Chalk. S.E. England. Toulmin Smith Coll.

D. 4827. A central axis with part of the external lamella (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

?**D. 4820.** A central axis (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

5. Inversaria laminata, nov.

DIAGNOSIS.

Zoarium of stout cylindrical branches. There are no tubercles or external ridges.

Zoœcia with raised peristomes, which are either irregularly arranged or occur in transverse rows. The exposed parts of the zoœcia are quadrangular, the zoœcia being separated by straight, parallel sutures.

Apertures circular or subtriangular.

Avicularia with circular aperture and long, spatulate, mandibular depression.

DIMENSIONS.

Diameter of branch	2–3 mm.
Diameter of zoœcia	·3–·5 ,,
Diameter of aperture	·2–·3 ,,
External length of avicularium	1 ,,

DISTRIBUTION.

Chalk: Ludsdown, W.S.W. of Rochester; Dover.

FIGURES.

Pl. XVI. Fig. 5*a*, part of a zoarium, showing the regular transverse rows of peristomes at the upper end; × 6 dia. Fig. 5*b*, part of the same zoarium, where the peristomes have been worn flush with the surface; × 10 dia. Chalk: Ludsdown. Bowerbank Coll. **D. 3104.**

AFFINITIES.

This species is most nearly allied to *I. tuberosa*, from which it differs by having circular rather than triangular apertures. *I. laminata*, in fact, has the zoœcia of the *Meliceritites lonsdalei* type, whereas in *I. tuberosa* they agree with those of *M. compressa*.

LIST OF SPECIMENS.

D. 3104. A zoarium (on chalk). Upper? Chalk. Ludsdown. Bowerbank Coll. Figd. Pl. XVI. Fig. 5.

D. 4534. A much branched zoarium (in chalk). Upper? Chalk. Dover? Bowerbank Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **dichotoma** (von Reuss), 1846.

SYN. *Escharites dichotoma*, von Reuss, 1846. Verst. böhm. Kr. p. 66, pl. xv. fig. 31.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
,, ,, Fric, 1870. Pal. Stud. böhm. Kr.: Arch. naturw. Landesf. Böhm. vol. i. pt. 2, p. 197.
,, ,, von Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 135, pl. xxv. fig. 8.

CHAR.—Thick cylindrical stems, with irregularly quincuncial, piriform to hexagonal zoœciæ. Apertures oval or with the lower margin flattened.

DISTRIB.—Turonian: Strehlen, Saxony, in Upper Pläner.
Cenomanian: Drahomischal, near Postelberg, and Zalabi, Bohemia.

2. **ramosa**, von Hagenow, 1850.

SYN. *Ceriopora milleporacea?* von Hagenow, 1839. Mon. Rüg.: N. Jahrb. p. 282.
Inversaria ramosa, von Hagenow, 1850. In Geinitz, Quadersandst. p. 244.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 59.
,, ,, Oswald, 1890. Bry. Meckl.: Arch. Ver. Mecklenb. vol. xliii. p. 105.

CHAR.—An *Inversaria* with very deeply sunken apertures and the zoœcia externally bounded by furrows.

DISTRIB.—Senonian—Campanian: Rügen.

3. **royana** (Waters), 1891.

SYN. *Melicertites royana*, Waters, 1891. Chil. Char.: Ann. Mag. Nat. Hist. ser. 6, vol. viii. p. 51, pl. vi. figs. 2, 4, 5, 6, and 11.

CHAR.—Branches stout, with one external layer round a thick axial bundle. Zoœcia externally lozenge-shaped, bounded by ridges with a tubercle at each angle. Apertures semicircular. Avicularia with the aperture transverse, slit, and large mandibular depression.

DISTRIB.—Senonian—Maastrichtian: Royan.

FORICULA, d'Orbigny, 1853.

[Bry. Crét. p. 657.]

DIAGNOSIS.

Zoarium of erect, cylindrical, dichotomous branches. The walls of the zoœcia are pierced by maculæ. Avicularia long and spatulate. A gonœcium or gonocyst.

TYPE SPECIES.

F. pyrenaica, d'Orbigny. Cenomanian : France.

AFFINITIES.

This genus has large numerous avicularia and the walls pierced by maculæ, which possibly occur in some species of *Nodelea.* But in *Foricula* they are well developed.

1. **Foricula aspera,** d'Orbigny, 1853.

SYNONYMY.

Foricula aspera, d'Orbigny, 1853. Bry. Crét. p. 659, pl. 742, figs. 1–5.
,, ,, Pergens, 1890. Revision, p. 399.

DIAGNOSIS.

Zoarium of thin branches. Apertures large, circular or subcircular, crowded, and quincuncial. The surface is punctate.

A pair of long, narrow avicularia occur, one on each side of the aperture.

DIMENSIONS.

Diameter of aperture	·20–·25	mm.
Diameter of zoœcia	·5	,,
Length of avicularian aperture	·25–·4	,,

DISTRIBUTION.

BRITISH :
Middle Chalk : Chatham.
FOREIGN :
Senonian—Santonian : Saintes, Charente-Inférieure.

FIGURE.

Pl. XVI. Fig. 8. Part of a branch, × 10 dia. Middle Chalk : Chatham. Gamble Coll. **D. 355.**

D. 355. A branch (on slide, with *Nodelea durobrivensis*, Greg.). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVI. Fig. 8.

2. **Foricula pyrenaica,** d'Orbigny, 1853.

SYNONYMY.

Foricula pyrenaica, d'Orbigny, 1853. Bry. Crét. p. 658, pl. 741, figs. 16–18.
,, ,, Pergens, 1890. Revision, p. 399.
,, ,, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 753, pl. xxii. figs. 11–13.

DIAGNOSIS.

Zoarium of very thin branches. Apertures quincuncial; about 14–25 in a circuit of the stem. Apertures semicircular to semi-elliptical.

Avicularia scarce, large, long, and sinuous.

Gonœcium (? gonocyst) piriform.

DISTRIBUTION.

FOREIGN:
Cenomanian: St. Calais and Le Mans, Sarthe; Rennes, Aude.

UNREPRESENTED SPECIES.

spinosa, d'Orbigny, 1853.

SYN. *Foricula spinosa*, d'Orbigny, 1853. Bry. Crét. p. 659, pl. 742, figs. 6–8.
,, ,, Pergens, 1890. Revision, p. 400.

CHAR.—Apertures large; straight lower margin. Apertures surrounded by a row of tubercles. Avicularia?

DISTRIB.—Senonian: Pons, Charente-Inférieure.
Turonian: Moutier, Charente.

Suborder CANCELLATA, Gregory, 1896.[1]

DIAGNOSIS.

Cyclostomata in which the zoarium consists of simple, tubular zoœcia with cancellate walls. The zoarium is not divided

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[1] Cat. Jur. Bry. p. 39.

into jointed segments. There are neither mesopores nor avicularia.

Affinities.

This group of Bryozoa may be described as Cyclostomata Tubulata with cancellate walls. This form of skeleton was apparently developed in the early part of the Cretaceous period, from the most specialized of the Idmonids. Whether the group is monophyletic is doubtful; but it is a convenient suborder, analogous to the group of Perforata among Madreporarian corals. It is adopted for descriptive purposes.

The group is considered before its proper position, as it should follow the Fasciculate section of Cyclostomata Tubulata. The cancellous character of the walls is due to the presence in them of a series of maculæ. This term was suggested in 1893 for the cavities in the walls of zoœcia (Gregory, "British Palæogene Bryozoa": Trans. Zool. Soc. vol. xiii. pt. 6, 1893, p. 221). They correspond in part with the 'pores d'origelles' of Jullien, the 'pores intermédiaires' of d'Orbigny, the 'cavités intersquelettiques' of Pergens, and in part to the 'dutinky kosterne' and 'pridavne bunky' of Pocta, and the 'mikroskopischen Porencanäle' of Marsson. The maculæ differ from mesopores, which are rudimentary zoœcia; and from interzoœcial spaces.

Family HORNERIDÆ.

Synonyms.

Horneridæ, Hincks, 1879.
Idmoniidæ, pars, Busk, 1875.
Crisinidæ, pars, d Orbigny, 1853.
Caveidæ, pars, d'Orbigny, 1853.

Diagnosis.

Cyclostomata Cancellata in which the zoarium is erect and branched. The apertures occur only on the obverse side; they are arranged in simple lines or are quite irregular. The reverse face may be marked by interzoœcial depressions, or may be covered by a laminated epitheca traversed by tubuli. Maculæ regular or irregular.

AFFINITIES.

This family is a branch from the Idmoniidæ, differing zoarially from that group by the arrangement of the zoœcia. Instead of having the alternate series of apertures characteristic of the Idmonids, the apertures are either quite irregularly arranged or occur in simple linear series.

Several authors, including Busk and Pergens, have included both Hornerids and Idmonids in one family. But this arrangement makes the Idmoniidæ a very cumbrous group, which is difficult of diagnosis. There are several points of resemblance between the two families. Thus, comparison of the figure of *Hornera lichenoides* (L.) with Fig. 16 on p. 195, which represents a corresponding section across *Retecava lichenoides* (Goldf.), shows the similarity of the laminated epitheca in both families.

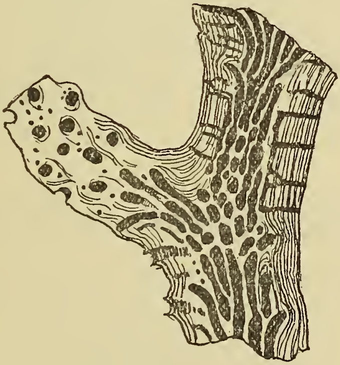

FIG. 44.—*Hornera lichenoides* (L.). Recent: Norway. A longitudinal section, × 12 dia.

In addition to the normal apertures there are in the Horneridæ two further sets of openings on the surface of the zoarium. In some cases, as in *Hornera langethali*, there occurs on the reverse surface a number of small raised tubuli. These are probably the prolongations of rudimentary zoœcia, which Pergens has described as 'canaux de renforcement.' They are often associated (as in Fig. 43*b*) with small depressions, which mark the sutures between zoœcia. In the section of *Hornera lichenoides* shown in Fig. 44, the lateral and obverse walls of the zoarium are penetrated by a series of fine canals, which form pores on the outer surface.[1] These canals may unite with one another, but apparently are not connected with the cavities of the zoœcia. They are mural cavities, described by d'Orbigny as 'pores intermédiaires,' and by Pergens as 'cavités intersquelettiques.' They may be regarded as branched maculæ.[2]

The Horneridæ date from Cretaceous times, the oldest genus being *Siphodictyum*. The most primitive genus is *Phormopora*, which, as the epitheca is rudimentary, accordingly presents a considerable resemblance to *Filisparsa* in the Diastoporidan series. Some of the species referred to *Filisparsa* may, in fact, be primitive forms of *Phormopora*.

In most Horneridæ the epitheca covers also the obverse face of the zoarium. But there is considerable variation in this respect, even in the limits of the same genus. Thus, the recent *Hornera lichenoides* (L.) has the obverse face buried by a fibro-reticulate epitheca; whereas in *H. violacea*, Sars, the obverse face is bare.

SIPHODICTYUM, Lonsdale, 1849.

[Foss. Zooph. Atherf.: Quart. Journ. Geol. Soc. vol. v. p. 94.]

SYNONYMS.

Filicavea, d'Orbigny, 1854.
Hornera, *pars*, von Zittel, 1880.

DIAGNOSIS.

Horneridæ in which the epitheca on the reverse side is thick. The apertures are in irregular transverse series. The maculæ occur in single or double longitudinal series below the aperture. The reverse side is ornamented by ridges, which may be reticular.

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[1] These mural canals must not be confused with the apparently similar canals traversing the lateral walls of *Retecava* (see Fig. 16, p. 195), which are normal zoœcia.

[2] Gregory. "British Palæogene Bryozoa": Trans. Zool. Soc. vol. xiii. pt. 6 (1893), p. 221.

TYPE SPECIES.

Siphodictyum gracile, Lonsdale, 1849. Lower Greensand: Isle of Wight.

AFFINITIES.

This genus is the oldest of the Horneridæ, and is important, as it forms a link between that family and the Idmoniidæ, while in one respect it approaches the Petaloporidæ. It is a typical Hornerid, as it has the reverse face covered by a reticulate series of ridges, the apertures arranged in subregular transverse series, and the walls pitted by maculæ. By the arrangement of the maculæ it resembles *Petalopora*, as they occur in regular single or double series below the apertures. I was therefore at first disposed to regard the genus as a Petaloporid, with the apertures confined to one surface.

Lonsdale gave a detailed and accurate description of the structure of the type species.

The genus differs from *Hornera*, its nearest ally, by the Petaloporoid arrangement of the maculæ.

Siphodictyum gracile (Lonsdale), 1849.

SYNONYMY.

Cricopora gracilis, Fitton, 1847. Sect. Atherf.: Quart. Journ. Geol. Soc. vol. iii. p. 302.

Siphodictyum gracile, Lonsdale, 1849. Foss. Zooph. Atherf.: Quart. Journ. Geol. Soc. vol. v. p. 94, pl. v. figs. 16–23.

,, ,, Morris, 1854. Cat. Brit. Foss., 2nd ed., p. 64.

Siphodictyon ,, Bristow, 1889. Geol. I. Wight, 2nd ed., p. 262.

,, ,, Norman, 1890. Geol. I. Wight, p. 38.

Hornera? ,, Vine, 1884. Fourth Rep.: Rep. Brit. Assoc. 1883, p. 169.

DIAGNOSIS.

Zoarium of thin, cylindrical, dichotomous branches, which do not anastomose. Most of the surface marked by longitudinal ribs. Apertures in transverse series or quite irregular.

DISTRIBUTION.

Lower Greensand—Folkestone Beds (Upper Aptian): Folkestone.
Lower Gryphea Beds in Ferruginous Sands (Lower Aptian): Whale's Chine, Atherfield.

FIGURES.

Fig. 45. Part of a longitudinal section of the specimen figured by Lonsdale (*op. cit.* pl. v. fig. 20), showing the maculæ in the laminated wall. Lower Greensand: Atherfield. **46,804.**

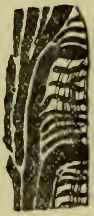

FIG. 45.—*Siphodictyum gracile*, Lonsd.

Pl. XII. Fig. 14. A worn zoarium. Lower Greensand—Folkestone Beds: Folkestone. Fig. 14*a*, part of the obverse surface, showing Petaloporoid arrangement of the maculæ; × 8 dia. Fig. 14*b*, a section, in part longitudinal on the reverse part of the zoarium, and in part transverse across a side branch; × 12 dia. Caleb Evans Coll. **D. 3023.**

Pl. XII. Fig. 15. Part of the obverse face of a better preserved specimen; × 10 dia. Lower Greensand — Folkestone Beds: Folkestone. J. S. Gardner Coll. **D. 3153.**

LIST OF SPECIMENS.

46,804.	The type-specimen. Lower Greensand: Lower Gryphea Beds. West of Whale's Chine, Isle of Wight. Figd. Lonsdale, *op. cit.* pl. v. fig. 16.
46,804.	A thin longitudinal section, from the same. Figd. by Lonsdale, *op. cit.* pl. v. fig. 20; and Fig. 45.
D. 3153.	A weathered zoarium. Lower Greensand: Folkestone Beds. Folkestone. Part of the zoarium, showing some zoœcia with the obverse face uninjured, is figured on Pl. XII. Fig. 15. J. S. Gardner Coll.
D. 3023.	A worn zoarium. Lower Greensand: Folkestone Beds. Folkestone. The Petaloporoid arrangement of the maculæ is shown on Pl. XII. Fig. 14*a*; a section showing a longitudinal section along the reverse side of a branch and transverse section across the central bundle and the obverse face of a branchlet, is figured as Pl. XII. Fig. 14*b*. Caleb Evans Coll.
D. 3155.	A large branched zoarium. Lower Greensand: Folkestone Beds. Folkestone.

UNREPRESENTED SPECIES.

degrossouvrei (Pergens). 1895.

Syn. *Filicavea dactylus, pars*, d'Orbigny, 1853–4. Bry. Crét. p. 940, pl. 773, figs. 8–11.
,, ,, *pars*, Pergens, 1890. Revision, p. 351.
,, *degrossouvrei*, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii., Pr. Vb. p. 135.

Char.—Zoarium dendroid; maculæ biserial and petaloporoid. Reverse surface marked by parallel, rarely branched ridges.

Distrib.—Senonian—Maastrichtian: Meudon.
Santonian: L'Arche de Lèves, near Chartres.

HORNERA, Lamouroux, 1821.

Synonyms.

Millepora, pars, Linnæus, 1768.
Retepora, pars, von Hagenow, 1839.
Idmonea, pars, Busk (1875).
Retihornera, Kirchenpauer (1869).
? *Stigmatoechos*, Marsson (1887).
? *Phormonotos, pars*, Marsson (1887).

Diagnosis.

Horneridæ with the zoarium composed of an axial zoœcial bundle and a thick lamellar epitheca on one or both surfaces. Apertures in subregular transverse series, or sometimes in subalternate rows. Maculæ irregularly distributed. Tubuli on reverse surface present or absent.

Type Species.

Hornera frondiculata, Lamouroux, 1821. Recent.

Affinities.

This genus was founded on a living Indo-Pacific and Mediterranean species, and in it are included two groups of species—one with a bare obverse face and the other with that face covered by reticular epithecal ridges. The genus begins in the Senonian, and is very abundant in the Lower Cainozoic.

Stigmatoechus, Mars., appears to be the most primitive form of *Hornera*, and may be worthy of subgeneric distinction. According to Marsson, it is separable from *Hornera* by the absence of 'subsidiary cells' (Nebenzellen); his figures[1] show the presence of maculæ.

Phormonotos was founded by Marsson on d'Orbigny's *Filisparsa crassa.* He included in the genus a second species, *P. gracilis*, which may be based on thin distal ends of branches of *H. langethali*, while *Filisparsa pulchella*, Mars., may represent a still younger stage.

Hornera langethali (von Hagenow), 1839.

SYNONYMY.

Retepora langethali, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 281.
,, ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 590.
Hornera ,, Römer, 1840. Verst. nordd. Kr. p. 20.
,, ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 238.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 30.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 32, pl. iii. fig. 2.
? *Phormonotos gracilis*, Marsson, 1887. *Ibid.* p. 34, pl. iii. fig. 6.
? *Filisparsa pulchella*, Marsson, 1887. *Ibid.* p. 35, pl. iii. fig. 7.

DIAGNOSIS.

Zoarium of cylindrical branches, which are laterally serrate, owing to the projection of the lateral peristomes. The obverse face is smooth and maculæ seldom open on the surface.

Apertures large. They occur in an irregular median series, and the lateral apertures occur in somewhat irregular, alternate rows.

The axial group of zoœcia is equal in diameter to half that of the branch.

Reverse face longitudinally furrowed, and bearing tubuli.

DISTRIBUTION.

Senonian—Campanian: Rügen.

AFFINITIES.

This species is included in *Hornera* by Römer and Marsson, and it appears to agree in all essential characters with the Cainozoic species of that genus.

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[1] Marsson. Bry. Rüg.: Pal. Abh. vol. iv. pt. 1, pl. iii. figs. 3*c*, *d*.

The apertures are somewhat Tervian in their arrangement. There is a median irregular series with two lateral series; in the latter the apertures tend to occur in transverse series, forming alternate serrations on the branches. This arrangement is, however, far less constant than is the case in Idmonids.

D. 6279. Two branches with prominent lateral serrations. Senonian: Mucronatenkreide. Rügen. Laur Coll.

DOUBTFUL AND UNREPRESENTED SPECIES.

1. compressa, von Hagenow, 1851. (Name only.)

Syn. *Hornera compressa*, von Hagenow, 1851. Bry. Maastr. Kr. p. 25.

Distrib.—Senonian: Sweden.

2 concatenata, von Reuss, 1869.

Syn. *Hornera concatenata*, von Reuss, 1869. Bry. Crosara: Denk. Ak. Wiss. Wien. vol. xxix. p. 283, pl. xxxv. figs. 5, 6.
,, ,, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. mal. Belg, vol. xxi., Mém. p. 217.

Char.—Of thin branches, with the apertures in transverse lateral interlocking series of from two to four. Obverse strongly ribbed longitudinally.

Distrib.—Danian: Faxoe.
Oligocene: Crosara.

3. ? gracilis, von Hagenow, 1850. (Name only.)

Syn. *Hornera gracilis* (*non* Phil.), von Hagenow, 1850. In Geinitz, Quadersandst. p. 238.

Distrib.—Senonian: Rügen.

4. ? oculata, von Hagenow, 1850. (Name only.)

Syn. *Hornera oculata*, von Hagenow, 1850. In Geinitz, Quadersandst. p. 238.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 25.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.

Distrib.—Senonian: Rügen.

5. trigonopora, von Hagenow, 1851. (Name only.)

Syn. *Hornera trigonopora*, von Hagenow, 1851. Bry. Maastr. Kr. p. 25.

Distrib.—Senonian: Sweden.

HEMICELLARIA, d'Orbigny, 1850.

[Prod. Pal. vol. ii. p. 86.]

SYNONYMS.

Semicellaria, d'Orbigny, 1853.
Laterocavea, d'Orbigny, 1853.
Reteporidea, pars, d'Orbigny, 1853 (*non* 1849).

DIAGNOSIS.

Horneridæ with the transverse series of apertures sometimes confused and irregular. The walls of the zoœcia are pitted by deep and numerous maculæ. The reverse is marked by interzoœcial depressions, or is cloaked by epitheca.

TYPE SPECIES.

Hemicellaria ramosa, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
Hornera perrieri, Pergens, 1890. Revision, p. 353.

The spelling of the generic name was corrected by d'Orbigny in 1853 to *Semicellaria*; but as *Hemicellaria* is equally correct and has three years' priority, that name is accepted. The inclusion of *H. ramosa* and of d'Orbigny's *Reteporidea ramosa* in the same genus rendered it necessary to rename one of them. Pergens changed the name of the former, though it was the older established species.

AFFINITIES.

It is necessary to include in *Hemicellaria* some species referred to *Laterocavea* and *Reteporidea*. The former was founded by d'Orbigny for two species, *L. dutemplei*, d'Orb., and *L. punctata*, d'Orb.: both of them were included by Pergens in *Idmonea*, but it is necessary to exclude them from that genus owing to the development of the epitheca and maculæ. *Reteporidea* was founded in 1849 by d'Orbigny, who made *R. lichenoides*, Goldf., his type species. That species is now included in *Retecava*, so that *Reteporidea* must be regarded as either a synonym of that genus or else replace it. But *Reteporidea* was so badly diagnosed that it is more convenient to accept *Retecava*, in spite of the fact that it was founded five years later. This course seems especially advisable, since d'Orbigny changed the use of the name *Reteporidea*; for in his "Cretaceous Bryozoa" he includes the type species in *Crisina*, and applies the generic name to the *royana* group of species. '*Reteporidea*' *royana* has an infundibuliform reticular zoarium, with the apertures in transverse alternate rows, and with the walls pitted by maculæ. The other species included by d'Orbigny in the genus, according to his later use of the name, have similar zoœcial characters, but the zoarium is not reticular. This character is therefore not generic; and the species of *Laterocava* in other respects agree with those of *Hemicellaria* and with those placed by d'Orbigny in 1854 in *Reteporidea*.

Hemicellaria royana (d'Orbigny), 1850.

SYNONYMY.

Reteporidea	*royana*,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 937.
,,	,,	d'Orbigny, 1851. Bry. Crét. pl. 608, figs. 1–5.
,,	,,	d'Orbigny, 1853–4. *Ibid.* p. 937, pl. 772, fig. 17.
Hornera	,,	Pergens, 1890. Revision, p. 354.
Reteporidea	*dactylus*,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 264.
,,	,,	d'Orbigny, 1851. Bry. Crét. pl. 607, figs. 13–16.
non Filicavea	,,	d'Orbigny, 1853. *Ibid.* pl. 773, figs. 8–11.
,,	,,	*pars*, Pergens, 1890. Revision, p. 351.

DIAGNOSIS.

Zoarium reticular and infundibuliform. Branches cylindrical.

Apertures in alternate rows of three or four; the rows often overlap.

Peristomes well raised.

DIMENSIONS.

		B.M., 60,560.	
Zoarium:	width of funnel	20	mm.
	height of funnel	22	,,
	diameter of stem	6	,,
	height of stem	3·5	,,
Apertures:	diameter	·08	,,

DISTRIBUTION.

Senonian—Maastrichtian: Royan, Charente-Inférieure, in Craie à Rudistes; Meudon.

60,560. A well-preserved specimen. Senonian: Craie à Rudistes. Royan. Presented by Hon. R. Marsham, 1878.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **depressa** (d'Orbigny), 1853–4.

Syn. *Reteporidea depressa*, d'Orbigny, 1853–4. Bry. Crét. p. 938, pl 773, figs. 4–7.
Hornera ,, Pergens, 1890. Revision, p. 353.

Char.—Zoarium of compressed, dichotomous branches; not reticular. Zoœcia Tervian in arrangement, there being an irregular median series.

Distrib.—Senonian—Maastrichtian: Meudon; Sainte-Colombe.

2. **dutemplei** (d'Orbigny), 1853.

Syn. *Laterocavea dutempleana*, d'Orbigny, 1853. Bry. Crét. p. 933, pl. 772, figs. 7–10.
Idmonea ,, Pergens, 1890. Revision, p. 350.

Char.—Zoarium of laterally compressed branches. Apertures in overlapping transverse rows. Maculæ numerous and irregular. Reverse face longitudinally ribbed.

Distrib.—Albian: Grandpré.

3. **lemoinei** (Peron), 1888.

Syn. *Reteporidea lemoinei*, Peron, 1888. Craie S.E. Bassin Anglo-Par.: Bull. Soc. Sci. nat. Yonne, vol. xli. p. 345, pl. iii. fig. 32.

Char.—Zoarium much branched. Apertures in oblique series, fairly regular. About six zoœcia in width of branch. Branches cylindrical.

Distrib. — Senonian — Campanian: zone of *Actinocamax quadratus*, Reims; and zone of *Magas pumila*, Chavot, near Epernay.

4. **perrieri** (Pergens), 1890.

Syn. *Hornera perrieri*, Pergens, 1890. Revision, p. 353.
Hemicellaria ramosa, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 86.
Semicellaria ,, d'Orbigny, 1853–4. Bry. Crét. p. 935, pl. 772, figs. 13, 14, 16.

Char.—Zoarium dendroid; the branches are cylindrical or slightly compressed, and divide dichotomously. The lateral rows of apertures overlap on the middle line of the obverse face.

Distrib.—Aptian: France.

Aff.—This species was generically separated owing to the prominence of a zoarial lamina. Pergens has pointed out that this median crest is less developed than d'Orbigny represented, and included the genus in *Hornera*.

?5. **punctata** (d'Orbigny), 1853–4 (*non* 1851).

Syn. *Laterocavea punctata*, *pars*, d'Orbigny, 1853–4. Bry. Crét. p. 933, pl. 772, figs. 11, 12, 15, 15 dup.
non Entalophora ,, *pars*, d'Orbigny, 1851. *Ibid.* pl. 623, figs. 4–7.

Char. — Branches cylindrical or slightly compressed. Rows of apertures extending across the whole side of the branch. Maculæ abundant.

Distrib.—Senonian—Maastrichtian: Meudon; Saint-Germain, near Paris; Veules, Seine-Inférieure.

Aff.—This species is regarded by Pergens as a synonym of *Retecava cancellata*, from which it appears to differ by the greater development of maculæ and the extension of the rows of apertures across the whole width of the sides of the branches.

Some confusion has been caused by mistakes in d'Orbigny's descriptions of his pl. 772; the references in the text and on the plate do not correspond. The following list gives the two sets of names, and what is probably the correct explanation of the plate:—

Pl. 772.	Reference on Plate.	In text.	Probable correct reference.
Figs. 11, 12.	*Laterocavea punctata.*	*Semicellaria ramosa.*	*Laterocavea punctata.*
,, 13, 14.	*Semicellaria ramosa.*	*Semicellaria ramosa.*	*Semicellaria ramosa.*
,, 15, 15 dup.	*Semicellaria ramosa.*	*Laterocavea punctata.*	*Laterocavea punctata.*
,, 16.	*Semicellaria ramosa.*	*Laterocavea punctata.*	*Semicellaria ramosa.*
,, 17.	*Reteporidea royana.*	*Laterocavea punctata.*	*Reteporidea royana.*
,, 18.	Fig. absent.	*Reteporidea royana.*	Fig. absent.

6. **ramosa** (d'Orbigny), 1851.

Syn. *Reteporidea ramosa*, d'Orbigny, 1851. Bry. Crét. pl. 608, figs. 6–10.
,, ,, d'Orbigny, 1853–4. *Ibid.* p. 937, pl. 773, figs. 1–3.
Hornera ,, Pergens, 1890. Revision, p. 353.

Char.—Zoarium infundibular, but not reticular; the branches are dichotomous and crowded, and subtrigonal in transverse section. Apertures in three transverse series; a median row alternating with two lateral rows; in places the plan is confused.

Distrib. — Senonian — Maastrichtian: Royan and Bougniaux, Charente-Inférieure; Meudon; Sainte-Colombe.

PHORMOPORA, Marsson, 1887.

[Bry. Rüg.: Pal. Abh. vol. iv. p. 32.]

Diagnosis.

Horneridæ with cylindrical, dichotomous branches; the apertures are scattered irregularly over the obverse face and not in regular transverse rows.

The reverse face is marked by small or well-developed tubuli.

TYPE SPECIES.

Phormopora irregularis, Marsson, 1887. Senonian: Rügen.

irregularis, Marsson, 1887.

SYN. *Phormopora irregularis*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 33, pl. iii. fig. 4.

CHAR.—Zoarium of thin stems: the apertures occur in irregular series. Apertures small. Pores of the tubuli on the reverse surface scattered between faint longitudinal furrows. In transverse section the zoœcia of the axial bundle occupy nearly the whole section.

DISTRIB.—Senonian—Campanian: Rügen.

Family PETALOPORIDÆ.

SYNONYMS.

Caveidæ, pars, d'Orbigny, 1854.
Cerioporidea, pars, Novak, 1877.
Entalophoridæ, pars, Marsson, 1887; Pergens, 1890.

DIAGNOSIS.

Cyclostomata Cancellata in which the zoarium is erect and dendroid; the zoœcia open on all sides of the branches. The walls are perforated by numerous maculæ.

AFFINITIES.

This family in the Cancellata corresponds to the Entalophoridæ among the Tubulata. The zoarial characters of the two families are the same, but the walls of the zoœcia in the Petaloporidæ are perforated by numerous maculæ, which usually appear on the surface as pores, though they may be externally concealed by epitheca.

The main problem in connection with this family is the structure of the maculæ. In the typical genus *Petalopora* (syn. *Cavea*) the maculæ superficially resemble the small pores of *Heteropora*. Accordingly M. Pergens has included *Cavea* in *Heteropora*. But the structure of the small pores in *Petalopora* and *Heteropora* is essentially distinct. The former are mural cavities, which are not continued into the axial bundle of zoœcia. In *Heteropora*, on the contrary, the smaller pores are rudimentary zoœcia, and are not cavities in the walls of single zoœcia (cf. *Heteropora conifera*, figd. Cat. Jur. Bry. p. 205, fig. 19*a*).

That the pores in *Petalopora* end off abruptly within the walls is shown in a figure by Pocta, reproduced as Fig. 46. A longitudinal section of *Sparsicavea carantina* (Fig. 49) shows similar mural maculæ. *Sparsicavea* is accordingly also included in the Petaloporidæ.

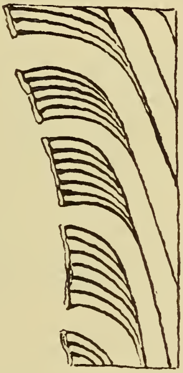

Fig. 46.—*Petalopora costata* (Orb.). Section through wall with maculæ. (After Pocta.)

The family includes a small part of d'Orbigny's Caveidæ, a name unsuitable, owing, among other reasons, to its similarity to Cavidæ.

Genus **PETALOPORA**, Lonsdale, 1850.

[Dixon, Geol. Sussex, p. 285.]

Synonyms.

Chrysaora, *pars*, Römer, 1840.
Zonopora, *pars*, d'Orbigny, 1850.
Heteropora, *pars*, von Hagenow, 1851; Pergens, 1896, etc.
Cavea, d'Orbigny, 1854.
Clavicavea, d'Orbigny, 1854.
Entalophora, *pars*, d'Orbigny, 1850.
Canalipora, *pars*, von Hagenow, 1851.

Diagnosis.

Petaloporidæ with cylindrical or slightly compressed branches.

The branches are usually ornamented by longitudinal, parallel ribs. Zoœcia with the front wall perforated by numerous maculæ arranged in longitudinal rows.

TYPE SPECIES.

Chrysaora pulchella, Römer, 1840. Campanian: North Germany.

1. **Petalopora pulchella** (Römer), 1840.

SYNONYMY.

Chrysaora pulchella, Römer, 1840. Verst. nordd. Kr. p. 24, pl. v. fig. 29.
Ceriopora ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 597.
Petalopora ,, *pars*, Lonsdale, 1850. In Dixon, Geol. Suss. p. 285, pl. xviii. A, figs. 7*f–h*, *non* 7*a–e*.
Canalipora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 242.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 49, note.
? ,, ,, Schlüter, 1870. Pal. Geogn. S. Schweden: N. Jahrb. 1870, p. 940.
non Cavea ,, d'Orbigny, 1853–4. Bry. Crét. p. 948, pl. 774, figs. 13–15.
? *Lithodendron gracile*, Goldfuss, 1827. Petref. Germ. p. 44, pl. xiii. fig. 2.
Chrysaora gracilis, Giebel, 1848. Plänerm. Quedl.: Zeit. Zool. Zoot. vol. i. p. 10.
Cavea ,, Brauns, 1875. Sen. Salzb.: Zeit. Ges. Naturw. vol. xlvi. p. 402.
Entalophora royana, d'Orbigny, 1851. Bry. Crét. pl. 624, figs. 4–8.
Cavea ,, d'Orbigny, 1854. *Ibid.* p. 945.
Heteropora ,, Pergens, 1890. Revision, p. 371.
Zonopora cæspitosa (*non* Röm.), d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
Cavea ,, (*non* Röm.), d'Orbigny, 1854. Bry. Crét. p. 942.
Heteropora (*Multizonopora*) *ligeriensis*, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 311.

DIAGNOSIS.

Zoarium of fairly stout, cylindrical branches. Apertures arranged in irregular verticels with about three or four rows in each.

Maculæ from three pairs to five or six pairs in each zoœcium.

DIMENSIONS.

Diameter of branch	1·5 mm.
Diameter of zoœcia	·15 ,,
Diameter of aperture	·08 ,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Sussex.
Middle Chalk: Chatham.

FOREIGN:

Senonian—Maastrichtian: Meudon; Royan.
Campanian: Quedlinburg and Gehrden, Hannover.
Santonian: Saintes, Charente-Inférieure.
Coniacian: Tours and Luynes, Indre-et-Loire; Villedieu, Loir-et-Cher.
Turonian or Coniacian: Vendôme, Lisle, Trôot, etc., Loir-et-Cher.
Turonian—Angoumian: Villardin, Loir-et-Cher; Moutier and Merpins, Charente.

FIGURES.

Pl. XII. Fig. 7. Part of a branch of a specimen figured by Lonsdale (*op. cit.* pl. xviii. A, fig. 7*f*); × 10 dia. Upper Chalk: Sussex. Dixon Coll. **B. 4485.**

AFFINITIES.

The zonal arrangement of this species, though somewhat irregular in its development, appears sufficiently constant to be of specific distinction from the commoner species *P. costata.*

D'Orbigny included *Ceriopora cæspitosa*, Röm., in this species, owing to a misprint by Römer, who in his text twice refers to his pl. v. fig. 29; but *Ceriopora cæspitosa* shown on Römer's pl. v. fig. 28 is quite different.

The figure given by Goldfuss of his *Lithodendron gracile* shows no apertures and is indeterminable, and the name therefore cannot claim priority.

LIST OF SPECIMENS.

BRITISH.

B. 4485. A branch with quadriserial zones. Upper Chalk. Sussex. Dixon Coll. Figured by Lonsdale in Dixon, Geol. Sussex, pl. xviii. A, fig. 7*f*; refigured on Pl. XII. Fig. 7.
B. 4488. Another branch. Chalk. Sussex. Dixon Coll. Figd. Lonsdale, *op. cit.* pl. xviii. A, fig. 7*h* (upper figure).
D. 4553. A branch (on slide). Upper Chalk. Sussex. Dixon Coll.
D. 4554. Two long branches. Chalk. Near Maidstone. Bowerbank Coll.
D. 700. A branch near the base. Middle Chalk. Chatham. Vine Coll. Recorded by Vine as *Heteropora* (*Multizonopora*) *ligeriensis*, Orb.
B. 4486. A branch in the stage of *polypora.* Chalk. Sussex. Dixon Coll. Figd. Lonsdale, *op. cit.* pl. xviii. A, fig. 7*g*.
B. 4487. Basal part of a branch almost completely buried in epitheca. Chalk. Sussex. Dixon Coll. Figd. Lonsdale, pl. xviii. A, fig. 7*h* (lower figure).

Foreign.

D. 4630. A fragment of the form *royana* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4628. Six fragments (on slide). Senonian: Craie de Villledieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4631. A fragment of the form *royana* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4460. Six branches (on slide). Senonian: Quadermergel. Salzberg, near Quedlinburg. Presented by Prof. H. Credner.

2. Petalopora cunningtoni, nov.

Diagnosis.

Zoarium of stout, short, cylindrical, dichotomous branches, which tend to grow in a single plane. Ridges imperfectly developed. Apertures uniformly distributed and sometimes in transverse rows. Maculæ about three or four pairs to each zoœcium.

Dimensions.

Diameter of branch	·8–1·6 mm.
Diameter of zoœcia	·15 ,,
Diameter of aperture	·08 ,,

Distribution.

Lower Greensand: Farringdon; ? Folkestone.

Figures.

Pl. XII. Fig. 11*a*, a zoarium, nat. size. Fig. 11*b*, part of the same, × 10 dia. Lower Greensand: loc. (probably Folkestone). Harford Coll. **D. 2301.**

Pl. XII. Fig. 12. A longitudinal section, × 10 dia. Lower Greensand: Farringdon. Cunnington Coll. **D. 5130.**

Pl. XII. Fig. 13. Part of a branch, × 10 dia. Lower Greensand: Farringdon. Cunnington Coll. **D. 7104.**

Affinities.

This species is allied to *P. costata* by the uniform distribution of the apertures; but the branches are shorter and stouter, and the longitudinal ribs are less developed.

LIST OF SPECIMENS.

D. 2301. A zoarium and a fragment of another. Lower Greensand. Loc. ? Harford Coll. Figd. Pl. XII. Fig. 11.

D. 5130. A longitudinal section. Lower Greensand. Farringdon. Cunnington Coll. Figd. Pl. XII. Fig. 12.

D. 7104. A small fragment. Lower Greensand. Farringdon. Cunnington Coll. Pl. XII. Fig. 13.

3. **Petalopora costata** (d'Orbigny), 1851.

Synonymy.

Entalophora costata, d'Orbigny, 1851. Bry. Crét. pl. 621, figs. 19–22.
Cavea ,, d'Orbigny, 1853–4. Bry. Crét. p. 944, pl. 774, fig. 4.
Heteropora ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 512.
,, ,, Pergens, 1890. Revision, p. 370.
,, ,, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 23, pl. iii. fig. 78.
,, ,, Pocta, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 207.
,, ,, Pocta, 1895. Bry. Arche de Lèves: *ibid.* vol. viii. p. 136.
,, ,, Pocta, 1895. Bry. Cachemb.: *ibid.* vol. viii. p. 183.
Entalophora appendiculata, d'Orbigny, 1851. Bry. Crét. pl. 622, figs. 11–14.
Cavea ,, d'Orbigny, 1853–4. *Ibid.* p. 944, pl. 774, fig. 5.
,, *regularis*, d'Orbigny, 1853–4. *Ibid.* p. 943, pl. 774, figs. 1–3.
,, *flexuosa*, d'Orbigny, 1853–4. *Ibid.* p. 947, pl. 774, figs. 9–12.
Heteropora ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 25.
Cavea pulchella, d'Orbigny, 1853–4. Bry. Crét. p. 948, pl. 774, figs. 13–15.
Petalopora ,, (*non* Röm.), Lonsdale, 1850. In Dixon, Geol. Suss. p. 285, pl. xviii. a, figs. 7*a–e*.
,, ,, Mantell, 1854. Med. Creat., 2nd ed., p. 270, pl. 224, fig. 1.
,, ,, *formæ regularis, costata, appendiculata,* and *flexuosa*, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 311.
Cavea polypora, d'Orbigny, 1853–4. Bry. Crét. p. 946, pl. 774, figs. 6–8.
Claricavea regularis, d'Orbigny, 1853–4. *Ibid.* p. 941, pl. 773, figs. 12, 13.
non Heteropora crassa, von Hagenow, 1851. Bry. Maastr. Kr. p. 46, pl. v. figs. 12, 13.
Heteropora crassa, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 26, pl. ii. fig. 5.
non ,, ,, Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.
,, *dumonti*, von Hagenow, 1851. Bry. Maastr. Kr. p. 48, pl. v. fig. 17.
Cavea ,, d'Orbigny, 1854. Bry. Crét. p. 942.
Petalopora ,, (*non* Hag.), von Reuss, 1872–3. In Geinitz, Bry. unt. Quad. Elbthalgeb.: Palæontogr. vol. xx. pt. 1, p. 132, pl. xxxiii. figs. 1–4.
,, ,, Novak, 1877. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 116, pl. ix. figs. 29–35.
Heteropora dichotoma, pars (*non* Goldf.), Hamm, 1881. Bry. mastr. Ob.-Sen. p. 36.
Petalopora seriata, Novak, 1877. *Op. cit.* p. 117, pl. ix. figs. 21–28; pl. x. figs. 3, 4.
,, ,, Fric, 1883. Isersch.: Arch. naturw. Landesf. Böhm. vol. v. No. 2, p. 127, fig. 111, p. 126.

Petalopora tenera, von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 133, pl. xxxiii. fig. 5.
? *Escharites seriata*, Römer, 1840. Verst. nordd. Kr. p. 17, pl. v. fig. 11.
? *Vaginopora* ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 602.
? *Ceriopora striata*, Giebel, 1848. Plänerm. Quedl.: Zeit. Zool. Zoot. etc. vol. i. p. 17.
? ,, *spinosa*, Giebel, 1848. *Ibid.* p. 17.

DIAGNOSIS.

Zoarium of long cylindrical branches, which divide dichotomously and may thicken distally.

Zoœcia from ten to fifteen in a circuit round the stem. The apertures are irregularly distributed, and not zonal.

The maculæ are irregular in size and number: the average number is about five pairs to each zoœcium. In old basal parts of the zoarium the pits become much smaller and closed; but may be more numerous and not restricted to a double row on each zoœcium (stage *polypora*).

The longitudinal vertical ridges are straight or somewhat flexuous (var. *flexuosa*). In basal parts of the zoœcia they are obscure.

DIMENSIONS.

	B.M., D. 713.
Diameter of branch	1 mm.
Diameter of zoœcia	·25 ,,
Diameter of aperture	·08 ,,

DISTRIBUTION.

BRITISH.

Upper Chalk: Dover; Charlton; Sussex; near Lewes.
Middle Chalk: Chatham.

FOREIGN:

Senonian—Maastrichtian: Maastricht; Fécamp, Seine-Inférieure.
Campanian: Rügen.
Santonian: Saintes, Charente-Inférieure; Cachembach and L'Arche de Lèves, near Chartres.
Coniacian: Luynes, Sainte-Paterne, La Ribochère, and near Tours, Indre-et-Loire; Lavardin, Loir-et-Cher.
Turonian or Coniacian: Lisle, Vendôme, Villavard, Les Roches, etc., Loir-et-Cher.
Turonian: St. Rimay, Villardin, and Angoulême, Charente; Martigues, Bouches-du-Rhône; Chorouschek, Vtelno, and Gross-Ujezd, Bohemia, in Iser Schichten.
Cenomanian: Plauen, Saxony, in Lower Quader; Kolin, Kank, and Jiné, Bohemia, in Korycaner Schichten; Essen, in Essener Grünsand.

FIGURES.

Pl. XII. Fig. 8. Longitudinal section along the lower portion of an old branch, × 10 dia. Chalk: Dover. Bowerbank Coll. **D. 7062.**

Pl. XII. Fig. 9*a*, base of a branch, nat. size. Fig. 9*b*, part of the same, × 18 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4514.**

Pl. XII. Fig. 10. Part of a branch of var. *appendiculata*, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 713.**

Fig. 46, p. 373. A longitudinal section across a few zoœcia, after Pocta.

Fig. 47. The distal end of a branch, of which part has longitudinal ribs and serial maculæ, and part has an epitheca which covers the ribs and has irregularly scattered maculæ; × 20 dia. Middle Chalk: Chatham. Vine Coll. **D. 2743.**

Fig. 48. Part of a branch with a lateral gonœcium, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 2740.**

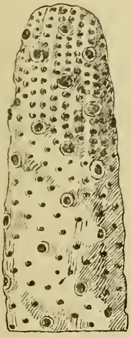

FIG. 47.

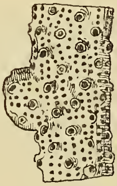

FIG. 48.

Petalopora costata (Orb.).

AFFINITIES.

This species usually has the maculæ in two rows along the front of each zoœcium; but a variety occurs with more than two rows, the *polypora* of d'Orbigny. Pergens remarks that that form is probably founded on a badly preserved specimen of *P. costata*; and it is interesting to notice that on the label attached to the polyporous specimen figured by Lonsdale (Geol. Suss. pl. xviii. A, fig. 7*c*) he has written "surface altered by age." On that specimen there are some zoœcia with the normal two rows of maculæ, a fact which seems to prove that the *polypora* form is only a variety. Novak's figure of his *P. seriata* (*op. cit.* pl. ix. fig. 22) shows biserial and multiserial maculæ in the same specimen.

The var. *tenera*, Reuss, is a variety with thin branches and multiserial maculæ. The var. *dumonti*, Hag., has distant and irregularly scattered apertures, with the longitudinal ribs either inconspicuous or absent; von Reuss, however, has included in *dumonti* a different form with well-developed vertical ribs. The true *dumonti* of von Hagenow is probably a thick basal fragment of *P. costata.*

The Cenomanian forms of this species have more sinuous ribs and are more frequently polyporous than the Senonian; the specimens available are too fragmentary for the definite determination as to whether the Cenomanian specimens may be specifically separated. This can only be settled by comparison of equivalent parts in a considerable series of specimens.

LIST OF SPECIMENS.

BRITISH.

60,253. A group of many branches. Chalk. Sussex. Dixon Coll. Figd. by Lonsdale as *Petalopora pulchella* (Röm.), in Dixon, Geol. Suss. pl. xviii. A, fig. 7.

B. 4480. A distal end of a branch. Chalk. Sussex. Dixon Coll. Figd. Lonsdale, *op. cit.* pl. xviii. A, fig. 7*a*.

B. 4481. Middle portion of a branch. Chalk. Sussex. Dixon Coll. Figd. Lonsdale, *op. cit.* pl. xviii. A, fig. 7*b*.

B. 4482. Basal portion of a branch, most of which is in the stage *polypora*; but biporous zoœcia also occur. Chalk. Sussex. Dixon Coll. Figd. Lonsdale, *op. cit.* pl. xviii. A, fig. 7*c*.

B. 4483. Two branches showing longitudinal section. Chalk. Sussex. Dixon Coll. Figd. Lonsdale, *op. cit.* pl. xviii. A, fig. 7*d*.

B. 4484. A branch showing transverse section. Chalk. Sussex. Dixon Coll. Figd. Lonsdale, *op. cit.* pl. xviii. A, fig. 7*e*.

D. 7062. A longitudinal section of part of base of a stem (on slide). Chalk. Dover. Bowerbank Coll. Figd. Pl. XII. Fig. 8.

D. 4514. Base of a young zoarium (on slide). Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XII. Fig. 9.

D. 713. A stem of var. *appendiculata*, with well-raised peristomes (on slide). Middle Chalk. Chatham. Vine Coll. Figd. Pl. XII. Fig. 10.

60,610. A block of chalk with many branches, some 40 mm. long. Some branches of var. *flexuosa*. Chalk. Offham Pit, Lewes. Capron Coll.

D. 3085. A block of chalk with several branches of the normal form of the worn, eroded stage *pulchella* (Orb., *non* Röm. *nec* Lonsd.). Chalk. Dover. Bowerbank Coll.

D. 4546. A block of chalk with many branches; some in stage *polypora*. Chalk. Dover. Bowerbank Coll.

D. 474. Branches in chalk. Middle Chalk. Chatham. Gamble Coll.

D. 4547. Many branches (one sub-zonary) in chalk. Chalk. Dover. Old Coll.

D. 4548. Several branches in chalk. Chalk. Dover. Bowerbank Coll.

D. 4549. Some branches, one in stage *pulchella*, Orb. Upper Chalk. Charlton. Old Coll.

D. 4550. Three branches in chalk. Chalk. S.E. England. Toulmin Smith Coll.

D. 4551. A large block of chalk with many projecting branches. Chalk. S.E. England. Toulmin Smith Coll.

D. 4552. Three branches on chalk. Chalk. Loc.? Old Coll.

D. 2968. Two branches showing longitudinal sections. Upper Chalk. Sussex. Dixon Coll.

D. 2969. Two old fragments obscured by epitheca. Upper Chalk. Sussex. Dixon Coll.

D. 3060. Two basal branches.
D. 3061. A thin, well-preserved branch.
D. 3062. A branch, partly in stage *polypora*.
D. 3063. Two old branches.
D. 3064. Two branches of var. *flexuosa*.
D. 3065. Two old branches with epitheca.
D. 3066. Two old branches of well-developed var. *flexuosa*.
D. 3067. Two old branches.

Upper Chalk. Sussex. Dixon Coll.

D. 2360. A branch (on slide). Upper Chalk. Sussex. Dixon Coll.

D. 665. A branch (on slide). Middle Chalk. Chatham. Vine Coll.

D. 463. Base of a young zoarium (on flint). Middle Chalk. Chatham. Gamble Coll.

D. 2740. A stem fragment with gonœcium (on slide). Middle Chalk. Chatham. Vine Coll. Figd. No. 48, p. 379.

D. 666. A well-preserved stem fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2743. A branched fragment, partly with vertical ribs and partly without. Middle Chalk. Chatham. Vine Coll. Figd. No. 47, p. 379.

D. 388, D. 389. Two stem fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4475. A branched stem fragment (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2742. A stem fragment (on slide with *Spiropora*, sp.). Middle Chalk. Chatham. Vine Coll.

D. 2359. Three large slabs of chalk with many specimens. Chalk. Loc.? Dixon Coll. One of them is referred to in Dixon, Geol. Suss. p. 285.

FOREIGN.

D. 4433. Two stem fragments (form *P. seriata*, Nov.). Iser Schichten. Ujezd, Bohemia. Fric Coll. A tendency to var. *flexuosa*.

D. 4620. Four fragments on slide; on the most branched specimen there is a circular zone bare of apertures as in *P. pulchella*. Turonian: Craie marneuse. St. Rimay. Purchased 1898.

D. 4621. Five long branches (on slide). Senonian: Coniacian. Luynes, Indre-et-Loire, in Craie de Villedieu. Purchased 1898.

D. 4622. Two thin branches (on slide). Senonian: Coniacian. Luynes, Indre-et-Loire, in Craie de Villedieu. Purchased 1898.

D. 4623. Two fragments of var. *flexuosa* (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4624. Three fragments of var. *flexuosa* (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4625, D. 4627. Two branched fragments of var. *regularis* (on slides). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4626. A long, thin fragment (on slide). Senonian. St. Mathurin. Purchased 1898.

D. 4629. Two fragments of var. *regularis* (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4615. Two fragments (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4616. Two larger branched fragments (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4617. Three fine fragments (on slide). Senonian. St. Mathurin. Purchased 1898.

D. 4618. Nine fragments (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4619. Six fragments (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

?**D. 4691.** A worn fragment (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 3614. Two branches of var. *polypora* (in tube). Cenomanian: Essen Grünsand. Essen. Damon Coll., 1877.

D. 3744. One thin distal and a basal fragment (on slide). Senonian. L'Arche de Lèves (near Chartres). Gamble Coll. Determined by Pergens.

D. 7064. Five fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7070. Four fragments of var. *dumonti*, Rss. (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7071. Five fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7072. Two fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7073. Four fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 7074. Eight fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

D. 6339. A thick fragment with crowded, uniformly distributed apertures (on slide). Maastrichter Kreide. Maastricht. Busk Coll. Identified by Busk as *Heteropora dumonti.*

D. 3728. Two large branches (on slide). Senonian. Ste. Paterne, Indre-et-Loire. Gamble Coll.

DOUBTFUL AND UNREPRESENTED SPECIES.

1. **? gemmata** (von Hagenow), 1839.

Syn. *Ceriopora gemmata*, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 283.
Pustulipora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 236.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 31.

Char.—Thin stems. Apertures arranged "in a zigzag upwards and downwards." Walls with numerous slender, lenticular depressions.

Distrib.—Senonian—Campanian: Rügen.

2. **prisca** (Gabb & Horn), 1862.

Syn. *Cavea prisca*, Gabb & Horn, 1862. Polyz. Sec. N. Amer.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 175, pl. xxi. fig. 67.

Char.—Zoarium of regular, dichotomous branches. Apertures oval. Maculæ pits three pairs to each zoœcia. Ribs flexuous.

Distrib.—Cretaceous: Fort Belknap, Texas.

Aff.—Allied to *P. costata* (Orb.), but with only three pairs of maculæ.

3. **striato-punctata** (von Hagenow), 1839.

Syn. *Ceriopora striato-punctata*, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 283.
Escharites ,, Römer, 1840. Verst. nordd. Kr. p. 17.
Canalipora ,, von Hagenow, 1850. In Geinitz, Quadersandst. p. 242.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 32.
,, ,, Schlüter, 1870. Geogn. Pal. S. Schweden: N. Jahrb. 1870, p. 940.

Char.—Probably closely allied to *P. costata*, but with laterally compressed branches.

Distrib.—Senonian—Campanian: Rügen; S. Sweden.

SPARSICAVEA, d'Orbigny, 1854.

[Bry. Crét. p. 948.]

Synonyms.

Entalophora, *pars*, d'Orbigny, 1850; Bucaille, 1890, etc.
Ceriopora, *pars*, d'Orbigny, 1850.
Heteropora, *pars*, von Hagenow, 1851; Pergens, 1890, etc.
Clausa, *pars*, d'Orbigny, 1853–4.

Diagnosis.

Petaloporidæ with irregularly distributed maculæ. The external ribs, when present, are usually radially arranged. The lower part of the stem may be bare of apertures and longitudinally ribbed.

The marsupial chamber is a gonocyst.

TYPE SPECIES.

Sparsicavea carantina, d'Orbigny, 1853–4. Senonian and Turonian: France.

AFFINITIES.

This genus is linked to *Petalopora* by the species *S. wrighti*, which in part has the typical radial ribs of *Sparsicavea*, while other parts of the same stem have strong longitudinal ribs and the maculæ in longitudinal series. This arrangement occurs in the basal parts of the stem in *S. francqana*, and in zones of the stem of *S. wrighti*.

The value of the generic separation of this group from *Petalopora* may be questioned, but in addition to the ornamentation of the stem there are other characters; the marsupial chamber is a gonocyst, not a gonœcium, and the stems are composed of fewer zoœcia with thinner and not laminated walls. The difference in longitudinal sections may be seen by comparing Pl. XII. Figs. 8 and 10 with Fig. 49 on p. 386.

1. **Sparsicavea carantina,** d'Orbigny, 1853.

SYNONYMY.

Sparsicavea carantina, d'Orbigny, 1853–4. Bry. Crét. p. 950, pl. 775, figs. 1–3.
,, ,, Pergens & Meunier, 1887. Bry. gar. Faxe: Ann. Soc. mal. Belge. vol. xxi., Mém. p. 211.
Heteropora ,, Pergens, 1890. Revision, p. 372.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 208.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 311.
,, ,, Pergens, 1895. Bry. Arche de Lèves: Bull. Soc. belge Géol. vol. viii., Pr. Vb. p. 136.
Sparsicavea francqana, d'Orbigny, 1853–4. Bry. Crét. p. 951, pl. 775, figs. 4–6.
Heteropora ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 512.
,, ,, Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 311.
Entalophora madreporacea, *pars*, Vine, 1893. *Ibid.* p. 309.
Heteropora obliqua, Vine, 1893. *Ibid.* p. 311.
,, *irregularis*, Vine, 1893. *Ibid.* p. 311.

DIAGNOSIS.

Zoarium of thin, cylindrical branches, which divide dichotomously. The branches end bluntly, and have no narrow prolongation bare of apertures. The walls are ornamented by well-marked radial ribs, between which are numerous pores. In places where the apertures are crowded and occur in regular spirals, the radial ribbing is obscure.

Peristomes highly raised, and ornamented by radial buttresses and ribs. The apertures are distant and irregularly scattered; but in older parts of the zoarium they are close and arranged in regular spirals.

Gonocyst a nodular or terminal expansion of the stem.

DIMENSIONS.

	Fide Pergens.	Form *carantina*.	Form *francqana*.
Diameter of a branch ...	·75–1·5 mm. ...	·7 mm. ...	1 mm.
Diameter of zoœcia ...	— ,, ...	·2 ,, ...	·3 ,,
Diameter of aperture ...	·08 ,, ...	·06 ,, ...	·08–·1 ,,

DISTRIBUTION.

BRITISH:

Upper Chalk: Croydon; Beachy Head; Bromley; Salisbury.
Middle Chalk: Chatham.

FOREIGN:

Danian: Faxoe.
Senonian: Département du Nord; Arche de Lèves, near Chartres.
  Coniacian: La Ribochère and Luynes, Indre-et-Loire.
Turonian: Angoulême, Charente; Villardin, Loir-et-Cher.

FIGURES.

Pl. XIII. Fig. 1. A branch of which the upper part shows the *carantina* and the lower the *francqana* forms; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 695.**

Pl. XIII. Fig. 2. A branch with the radial ribbing only faintly recognizable; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 2623.**

Pl. XIII. Fig. 3. A worn zoarium in which the wall with the maculæ has been removed; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 698.**

Pl. XIII. Fig. 4. A branch with the upper part rubbed down to show the maculæ in cross section; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 721.**

Pl. XIII. Fig. 5. A branch of the form *francqana*, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4071.**

Pl. XIII. Fig. 6. A branch with a gonocyst, × 10 dia. Upper Chalk: Croydon. Old Coll. **D. 4479.**

Pl. XIII. Fig. 7. A branch of form *francqana* with gonocyst, × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 432.**

Fig. 49. A longitudinal section, × 14 dia. Middle Chalk: Chatham. Vine Coll. **D. 2703.**

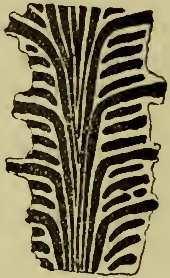

Fig. 49.—*Sparsicavea carantina*, Orb. Longitudinal section.

Affinities.

The two forms *carantina* and *francqana* as figured by d'Orbigny look extremely distinct; they were united by Pergens, who regarded the figure of the latter as exaggerated. But, as Vine has remarked, it fairly represents some of the Chatham specimens. The occurrence, however, of both types in different parts of the same zoarium, in Chatham specimens, as shown on Pl. XIII. Fig. 1, shows the justice of Pergens' decision.

The species is chiefly allied to *S. orbignyi*, from which it differs by the absence of the bare terminal zones. The character of the ends of the branches is shown in the specimen **D. 436**: the radial ribbing is not developed, and the apertures occur surrounded by scattered maculæ.

LIST OF SPECIMENS.

British.

D. 695. A fragment of a zoarium showing transition from the irregular and distant apertures to regularly spiral arrangement. Middle Chalk. Chatham. Vine Coll. Figd. Pl. XIII. Fig. 1.

D. 2623. Two branches (on slide). One shows the occurrence of both ribbed and punctate ornamentation in the same specimen. Middle Chalk. Chatham. Vine Coll., No. 28. Recorded by Vine as *Entalophora madreporacea*, Goldf.: Rep. Brit. Assoc. 1892, p. 309. Figd. Pl. XIII. Fig. 2.

D. 698. A branched fragment with worn surface (on slide). Middle Chalk. Chatham. Vine Coll., No. 64. Recorded by Vine as *Heteropora* (*Sparsicavea*) *carantina*, Orb.: Rep. Brit. Assoc. 1892, p. 311. Figd. Pl. XIII. Fig. 3.

D. 721. A branch partly cut down to show the maculæ. Middle Chalk. Chatham. Vine Coll. Figd. Pl. XIII. Fig. 4.

D. 4071. Three specimens, numbered 3 and 6 on slide. Middle Chalk. Chatham. Gamble Coll. Specimen No. 6 figd. Pl. XIII. Fig. 5.

D. 4479. A branch 12 mm. long, with an ovoid gonocyst. Upper Chalk. Croydon. Old Coll. Figd. Pl. XIII. Fig. 6.

D. 432. Three branches, one of which has a gonocyst. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIII. Fig. 7.

D. 2703. A branch (on slide), and two sections, transverse and longitudinal, of form *carantina* (on slide). Middle Chalk. Chatham. Vine Coll. Longitudinal section figd. No. 49, p. 386.

D. 7102. Group of small fragments. Upper Chalk. Beachy Head. Presented by the author.

48,183. A well-preserved zoarium in hollow of flint. Upper Chalk. Bromley. J. Simmons Coll.

D. 2701. A branch with expansion, ? gonocyst (on slide). Middle Chalk. Chatham. Vine Coll., No. 72.

D. 2744. Four branches of form *carantina* (on slide). Middle Chalk. Chatham. Vine Coll.

D. 487. A branch of *carantina-obliqua* type showing blunt ending, on chalk with *Entalophora*, sp. Middle Chalk. Chatham. Gamble Coll.

D. 436. Three branches of the form *francqana* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 435. Three branches of the form *francqana* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 694. Two branches of the form *francqana* (on slide). Middle Chalk. Chatham. Vine Coll., No. 62. Recorded as *Heteropora carantina* = *Sparsicavea francqana.*

D. 696. Two branches, one of the form *carantina*, the other of the form *francqana.* Middle Chalk. Chatham. Vine Coll., No. 58. Recorded by Vine as *Heteropora obliqua* and *C. irregularis.*

D. 693. Two branches with ornamentation of the form *francqana*, Orb., but with more spirally arranged apertures (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Heteropora* (*Sparsicavea*) *francqana*, Orb., by Vine: Rep. Brit. Assoc. 1892, p. 311.

D. 434. Three branches of the form *francqana* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 438. A well-preserved **Y**-shaped branch with high peristomes, form *francqana* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4341. A fragment on flint with *Nodelea durobrivensis*, Greg. Middle Chalk. Chatham. Gamble Coll.

D. 5435. Longitudinal and transverse sections cut from **D. 4341** (on slides).

D. 2652. A fragment of form *carantina.* Upper Chalk. Salisbury. Vine Coll. Identified by Vine as *Heteropora irregularis.*

D. 2706. A branched fragment of var. *francqana* (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2698. A silicified fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2707. A branch in the form *carantina*, passing down to the less spiral form of *francqana* (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2756. A Y-shaped branch of form *francqana* encrusted by *Micropora*, sp. Middle Chalk. Chatham. Vine Coll.

D. 654. Two branches of the typical form (on slide). Middle Chalk. Chatham. Vine Coll., No. 41. Recorded by Vine as *Entalophora madreporacea*.

D. 2627. Two worn fragments (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4113. Two fragments (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2710. A Y-shaped specimen on parts of which the radial ribbing may be recognized: most of the specimen is in the typical *carantina* form. (On slide with fragment of *Entalophora*.) Middle Chalk. Chatham. Vine Coll.

D. 697. A branch of typical, unribbed form *carantina* (on slide). Middle Chalk. Chatham. Vine Coll. Recorded as *Heteropora* (*Clausa*) *obliqua*, Orb.

Foreign.

D. 4876. Two fragments (on slide). Turonian: Craie marneuse. Villardin Station. Purchased 1898.

D. 4878. A branched fragment of var. *francqana* (on slide). Turonian: Craie tuffeau. Villardin Station. Purchased 1898.

D. 4696. A thin branch in the stage analogous to the *micropora* form of *S. heteropora*. Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 3743. A small fragment (on slide). Senonian. L'Arche de Lèves. Gamble Coll.

2. Sparsicavea wrighti, nov.

Diagnosis.

Zoarium of thin, cylindrical branches, which divide dichotomously. Ornamented externally by delicate radial and longitudinal ribs. At intervals along the stem the radial ribs disappear; long, regular, longitudinal ribs are then well developed, and between them are numerous maculæ, so that such areas of the stem resemble *Petalopora*.

Peristomes of medium height (in well-preserved specimens).

Apertures large, spiral, or quincuncial, mostly regular in arrangement.

Dimensions.	D. 3277.	D. 2834.
Diameter of stem	·6–·7 mm.	1 mm.
Diameter of zoœcia	·18–·25 ,,	·2–·28 ,,
Diameter of aperture	·1 ,,	·1 ,,

DISTRIBUTION.

Upper Chalk: Bromley, Kent; Slieve Gallion, county Derry.

FIGURES.

Pl. XIII. Fig. 14. A stem fragment, × 8 dia. Upper Chalk: Bromley. Simmons Coll. **D. 2834.**

Pl. XIII. Fig. 17. A stem, × 12 dia. Upper Chalk: Slieve Gallion, Derry. Presented by J. Wright, Esq. **D. 3277.** Fig. 17*b* is the continuation of the lower part of Fig. 17*a*.

AFFINITIES.

This species is of interest from its union of the radial ribbing of *Sparsicavea* with, in places, a Petaloporoid arrangement of maculæ. The maculæ are large and elongate, and resemble those of the *Cavea elongata* of d'Orbigny and von Reuss (p. 397).

LIST OF SPECIMENS.

D. 3277. Five long fragments. Upper Chalk Powder. Slieve Gallion, county Derry. Presented by J. Wright, Esq. Figd. Pl. XIII. Fig. 17.

D. 2834. A small fragment (on slide). Upper Chalk. Bromley. Simmons Coll. Figd. Pl. XIII. Fig. 14.

3. **Sparsicavea undulata** (von Hagenow), 1851.

SYNONYMY.

Heteropora undulata, von Hagenow, 1851. Bry. Maastr. Kr. p. 47, pl. v. fig. 16.
,, ,, Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 208.
Clausa ,, d'Orbigny, 1854. Bry. Crét. p. 894.
Sparsicavea ,, d'Orbigny, 1854. *Ibid.* p. 949.
,, ,, Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.
Heteropora dichotoma, *pars*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 36.

DIAGNOSIS.

Zoarium of compressed branches which dichotomize but rarely. The zoarium appears laterally notched, owing to the presence of alternate lateral areas, free from apertures, which are surrounded by a prominent rim.

Maculæ in sinuous longitudinal series, or in circular series round the apertures.

Apertures crowded; quincuncially arranged.

DISTRIBUTION.

Senonian — Maastrichtian : Falkenberg ; Maastricht ; St. Pierre ; Bemelen.

FIGURES.

Fig. 50. Part of a branch showing lateral notches, × 8 dia. Maastrichter Kreide : Maastricht. Van Breda Coll. **D. 3498.**

Fig. 51. Part of a longitudinal section, × 7½ dia. Maastrichter Kreide : Maastricht. Van Breda Coll. **D. 7101.**

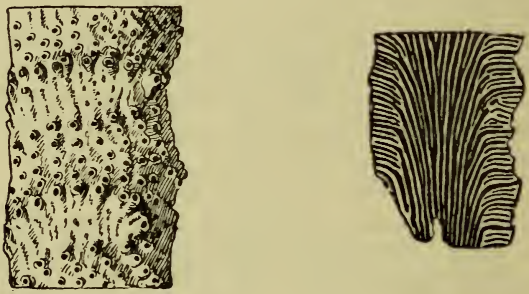

FIG. 50. FIG. 51.

Sparsicavea undulata (Hag.).

AFFINITIES.

This species was founded by von Hagenow on a very imperfect and worn specimen. His figures give no idea of the definite lateral notches which adorn well-preserved specimens of this species. I think, however, that there can be little doubt that the specimens shown by Figs. 50 and 51 should be included in *Heteropora undulata*, Hag., for a series of specimens in the Breda Collection establish the connection between them.

LIST OF SPECIMENS.

D. 3328. A well-preserved specimen (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3498. A specimen laterally, instead of transversely compressed (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll. Figd. No. 50.

D. 3530. Four worn fragments in the form *undulata* (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3296. A long branched specimen (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3489. Two fragments of form *undulata* (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3486. Two worn fragments of form *undulata* (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3528. Four fragments (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 1377. Two very worn fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3476. One long branched specimen with well-preserved lateral notches and a worn basal fragment, probably also of this species (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

60,157. A series of branches. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 7101. A longitudinal and transverse branch cut from a specimen of **60,157.** Fig. No. 51.

D. 7103. A transverse section (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3478. Eight branches (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3560. A long branch (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3480. A series of branches (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3483. Three well-preserved branches (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3482. Three fragments cut to show longitudinal median, longitudinal marginal, and transverse sections (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3484. Two fragments, one of which is the proximal part of a stem (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3474. A thick branch with base (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3475. A long, well-preserved branch (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3753. A worn branch (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6342. A worn branched specimen (on slide). Maastrichter Kreide. St. Pierre. Busk Coll.

D. 6341. Several worn fragments (on slide). Maastrichter Kreide. Bemelen. Busk Coll.

4. Sparsicavea cicatrix, nov.

DIAGNOSIS.

Zoarium of cylindrical, dichotomous branches. The surface is marked by bare lateral areas without ridges or apertures. The surface is marked elsewhere by prominent ridges radiating from the peristomes.

Apertures circular, irregularly quincuncial, in oblique series.

DIMENSIONS.

Diameter of branch	1·8 mm.
Diameter of zoœcia	·25 ,,
Diameter of aperture	·15 ,,
Vertical width of bare zone	·5 ,,

DISTRIBUTION.

Senonian—Coniacian: South of Les Roches, Loir-et-Cher, in Craie de Villedieu.

Turonian—Angoumian: Villardin and Montoire, Loir-et-Cher, in Craie marneuse.

FIGURE.

Fig. 52. Part of a branch, × 10 dia. Turonian: Villardin. **D. 4838.**

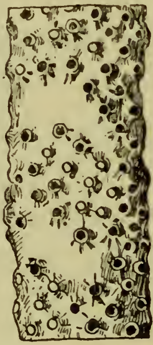

FIG. 52.—*Sparsicavea cicatrix*, n.sp.

AFFINITIES.

This species most closely resembles *S. undulata* (Hag.), from which it differs by having the apertures in oblique instead of in vertical series, and by having radial ribs round the apertures.

LIST OF SPECIMENS.

D. 4838. A fragment of a zoarium (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898. Figd. No. 52.

D. 4835. Two fragments (on slide). Turonian : Craie marneuse. Villardin Station. Purchased 1898.

D. 4836. One thick fragment (on slide). Turonian : Craie marneuse. Montoire. Purchased 1898.

D. 4837. One fragment (on slide). Turonian: Craie marneuse. Montoire. Purchased 1898.

D. 4844. A thin, worn fragment (on slide). Senonian : Craie de Villedieu. South of Les Roches. Purchased 1898.

5. **Sparsicavea reticulata** (Marsson), 1887.

SYNONYMY.

Heteropora reticulata, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 26, pl. ii. fig. 4.

DIAGNOSIS.

Zoarium of fairly stout, cylindrical branches.

Apertures irregularly scattered and distant; separated by broad bands of coarse, angular maculæ.

DISTRIBUTION.

Senonian—Campanian: Rügen.

D. 6304, D. 6307. Fragments on slides. Mucronatenkreide. Rügen. Laur Coll. Purchased 1899.

6. **Sparsicavea dichotoma** (Goldfuss), 1827.

SYNONYMY.

Ceriopora dichotoma, Goldfuss, 1827. Petref. Germ. vol. i. p. 34, pl. x. fig. 9.
,, ,, von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 282, ? pl. v. fig. 4.
,, ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. iii. p. 597, pl. xxiii. *b*, fig. 13.
Heteropora ,, de Blainville, 1830. Zooph.: Dict. Sci. nat. vol. lx. p. 382.
,, ,, de Blainville, 1834. Man. Act. p. 417.
,, ,, M. Edwards, 1836. Lamarck, Hist. Nat., 2nd ed., vol. ii. p. 317.
,, ,, Römer, 1840. Verst. nordd. Kr. p. 24.
,, ,, von Hagenow, 1851. Bry. Maastr. Kr. p. 47, pl. v. fig. 15.
,, ,, Drescher, 1863. Kreid. Löwenberg: Zeit. deut. geol. Ges. vol. xv. p. 360.
,, ,, Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 208.
,, ,, *pars*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 36.
Sparsicavea ,, d'Orbigny, 1854. Bry. Crét. p. 949.
,, ,, Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.

DIAGNOSIS.

Zoarium of thick, dichotomous, cylindrical branches. The apertures occur somewhat irregularly.

The maculæ are arranged in sinuous, longitudinal series, connected transversely by one or two maculæ, where the longitudinal series approach nearest to one another. The surface of the zoarium is thus cut up into hexagonal areas by the lines of maculæ. The apertures may occur in the centre of these hexagonal areas, but usually at the upper end, above a tumid, oval area like the front wall of a *Lepralia* or a *Mucronella*.

DISTRIBUTION.

Senonian—Maastrichtian: Maastricht; Falkenberg; St. Pierre; Petit Lanaye; Heer; Neu Warthau, Silesia (*fide* Drescher).

AFFINITIES.

Von Hagenow gave one figure of this species (Bry. Maastr. Kr. pl. v. fig. 15*i*), which has the general appearance of a Cheilostomatous Bryozoan; but there are in the Museum collection a series of specimens which show that von Hagenow was correct in including in one species the different specimens figured by him. The apparently hexagonal zoœcia and tumid front wall are due to the arrangement of the maculæ, in zigzag, simple lines. Beneath the apertures there is accordingly left a raised tubercle, free from maculæ.

The longitudinal series of apertures gives a somewhat Petaloporoid aspect to worn specimens.

LIST OF SPECIMENS.

D. 3738. Two fragments, one very well preserved (on slide). Maastrichter Kreide. Petit Lanaye. Gamble Coll.

D. 3294. Two branched zoaria (on slide). Maastrichter Kreide. Maastricht. Old Coll.

D. 3759. Three fragments (on slide). Maastrichter Kreide. Maastricht. Gamble Coll.

D. 6338. Seven worn fragments (on slide). Maastrichter Kreide. St. Pierre. Busk Coll.

D. 3355. The thick base of a zoarium. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 1376. A branched fragment. Maastrichter Kreide. Maastricht. Vine Coll.

D. 1378. Two fragments, one of which shows the well-preserved tubercles below the apertures. The other specimen has the maculæ in sinuous, longitudinal series. Maastrichter Kreide. Maastricht. Vine Coll.

D. 3457. A specimen (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

? **D. 1284.** Two very worn and rolled fragments. The specimen is labelled by Vine as from Le Mans, a Cenomanian locality; but the aspect of the specimens suggests that they came from Maastricht. Vine Coll.

D. 6337. Several specimens (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

7. Sparsicavea pustulosa (d'Orbigny).

SYNONYMY.

Myriozoum pustulosum, d'Orbigny, 1853. Bry. Crét. p. 662, pl. 783, figs. 1–3.
,, ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 508.
,, ,, Pergens, 1890. Revision, p. 400.
Melicertites pustulosa, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 212.
Entalophora clava, pars, d'Orbigny, 1851. Bry. Crét. pl. 620, fig. 6 (*non* figs. 1–5).
non Claviclausa clava, d'Orbigny, 1853. *Ibid.* pl. 765, fig. 5.

DIAGNOSIS.

Zoarium of dichotomously branched or of single clavate branches. Apertures large and crowded, and quincuncial. Maculæ in single narrow series around the sutures, or a complete ring round each aperture.

DIMENSIONS.

Diameter of branch	... ...	3 mm.
Diameter of aperture	... ...	·3 ,,
Diameter of zoœcia	... ...	·6 ,,

DISTRIBUTION.

BRITISH:

Upper Greensand: Warminster.

FOREIGN:

Senonian—Coniacian: St. Paterne and La Ribochère, Indre-et-Loire.
Cenomanian: Cap de la Hève, Seine-Inférieure; Kank, Bohemia, in Korycaner Schichten.

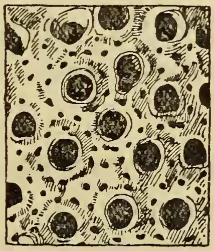

FIG. 53.—*Sparsicavea pustulosa* (Orb.).

FIGURE.

Fig. 53. Part of a zoarium with the maculæ in complete series to each zoœcium; × 11 dia. Cenomanian—Craie chloritée: Cap de la Hève. Presented by Wm. Hill, Esq. **D. 4390.**

AFFINITIES.

The general aspect of this species is much like that of the earlier figures of *Myriapora* (*Myriozoum*); but that genus is a Schizoporellid, and thus is far removed from the Cretaceous species which d'Orbigny referred to it. This species is very distinct from the other *Sparsicaveæ*, and may perhaps deserve generic distinction; for in many parts of the zoarium the maculæ occur only as widenings of the interzoœcial sutures. But in other parts, as in that shown in Fig. 53, the maculæ occur as a single ring in the wall of each zoœcium, and thus the species may be regarded as a *Sparsicavea* with large apertures and few maculæ.

The specimen figured by d'Orbigny as *Entalophora clava* (viz. pl. 620, fig. 6) seems to be clearly a specimen of this species: it has the large apertures surrounded by a ring of maculæ. The zoœcia subsequently figured by d'Orbigny when he included the species in *Claviclausa* (pl. 765, fig. 5) have small apertures and are surrounded by a wide intermediate zone; they belong to one of the more typical *Spavsicaveæ*, probably to a fragment of *S. heteropora* with the apertures less crowded than in the typical form.

Pergens included specimens figured by d'Orbigny (viz. pl. 620, fig. 6) as *Heteropora clava* in *Cavea elongata*; but M. Canu[1] has pointed out the difference between them.

LIST OF SPECIMENS.

BRITISH.

23,220. A large zoarium. Upper Greensand. Warminster. J. Baker Coll.

FOREIGN.

D. 4390. Two zoaria. Cenomanian. Cap de la Hève, Seine-Inférieure. Presented by W. Hill, Esq. Figd. No. 53, p. 395.

D. 7065. A thick branched fragment (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **concinna** (Römer), 1840.

SYN. *Heteropora concinna*, Römer, 1840. Verst. nordd. Kr. p. 4, pl. v. fig. 27.
,, ,, Schlüter, 1870. Reise S. Schwed.: N. Jahrb. 1870, p. 940.
Millepora madreporacea, Giebel, 1848. Plänerm. Quedl.: Zeit. Zool. Zoöt. vol. i. p. 10.

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[1] Canu. Bry. St. Cal.: Bull. Soc. géol. France, ser. 3, vol. xxv. p. 747.

Char.—Branches short, thick. Maculæ very abundant in several rows round the circular apertures. According to Giebel the form differs from *Petalopora* only by the absence of pores in furrows.

Distrib.—Senonian—Campanian: Gehrden; Salzberg; the Kluss, etc.; S. Sweden.

2. **cribraria** (d'Orbigny), 1851.

Syn. *Entalophora cribraria*, d'Orbigny, 1851. Bry. Crét. pl. 623, figs. 11–14.
Sparsicavea ,, d'Orbigny, 1854. *Ibid.* p. 950.
,, ,, Pergens, 1890. Revision, p. 375.

Char.—Zoarium of thin, fragile, dichotomous branches. Peristomes highly raised, irregular in distribution, and widely scattered. Maculæ minute, and numerous.

Distrib.—Senonian: Meudon.

3. **elongata** (d'Orbigny), 1853.

Syn. *Cavea elongata*, d'Orbiguy, 1853–4. Bry. Crét. p. 942, pl. 773, figs. 14–16.
Petalopora elongata, von Reuss, 1874. Bry. ob. Plän.: Palæontogr. vol. xx. pt. 2, p. 137, pl. xxvi. fig. 1.

Char.—Zoarium of regular, cylindrical branches formed of about ten zoœcia. Apertures quincuncial. Maculæ long and narrow, separated by vertical ridges.

Distrib.—Turonian: Upper Pläner, Saxony.
Cenomanian: Le Mans, Sarthe; Strehlen, Saxony, in Upper Pläner.

4. **irregularis** (d'Orbigny), 1851.

Syn. *Entalophora irregularis*, d'Orbigny, 1851. Bry. Crét. pl. 617, figs. 5–7; *non* 1850, Prod. Pal. vol. ii. p. 267, *nec* 1851, Bry. Crét. pl. 624, figs. 9–12.
Sparsicavea ,, d'Orbigny, 1853–4. Bry. Crét. p. 949.
,, ,, Pergens, 1890. Revision, p. 375.

Char.—Zoarium of cylindrical, dichotomous, anastomosing branches. Apertures circular; peristomes raised and irregularly distributed. Maculæ in circular series round the peristomes.

Distrib.—Albian: Machéroménil, Ardennes.

5. **marssoni**, nov. nom.

Syn. *Sparsicavea irregularis*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 26, pl. ii. fig. 6.

Char.—Of stout branches, consisting of an axial bundle surrounded by a cancellous, lamellated epitheca. Apertures in irregular, transverse rows.

Distrib.—Senonian—Campanian: Rügen.

6. **tamulica** (Stoliczka), 1872.

Syn. *Heteropora tamulica*, Stoliczka, 1872. Pal. Ind.: Cret. Fauna S. Ind. vol. iv. pt. 2, p. 28, pl. iii. fig. 4.

Char.—Thick cylindrical stems with irregularly and widely scattered apertures, surrounded by deep cancelli.

Distrib.—Turonian—Arrialoor Group: Yermanoor, S. India.

7. ? **tricarinata** (Giebel), 1848.

Syn. *Ceriopora tricarinata*, Giebel, 1848. Plänerm. Quedl.: Zeit. Zool. Zoot. vol. i. p. 17.

Char.—Triangular, thin stems. Apertures small, surrounded by fine pores.

Distrib.—Campanian: Quedlinburg, in Plänermergel.

CŒLOCOCHLEA, von Hagenow, 1851.

Diagnosis.

Petaloporidæ with a zoarium of hollow stems marked by annular ridges with sparsely scattered maculæ.

Type Species.

Cœlocochlea torquata, von Hagenow, 1851. Maastrichtian: Maastricht.

Affinities.

This genus is allied to *Sparsicavea* by the species *S. undulata* and *dichotoma*.

Cœlocochlea torquata, von Hagenow, 1851.

Synonymy.

Cœlocochlea torquata, von Hagenow, 1851. Bry. Maastr. Kr. p. 54, pl. vi. fig. 4.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 37.
Diastopora pustulosa, d'Orbigny, 1854. Bry. Crét. p. 827.

Diagnosis.

Zoarium of thick branches, with prominent ridges, which project like platforms along the sides of the stem and in a radial series at the summit.

Zoœcia often in longitudinal series near the platforms. A small tumid area below the aperture (as in *S. dichotoma*).

Distribution.

Senonian—Maastrichtian: Maastricht.

LIST OF SPECIMENS.

D. 3406. Two compressed branches (in tube). Maastrichter Kreide. Maastricht. Van Breda Coll.

P. 1492. Two well-preserved specimens. Maastrichter Kreide. Maastricht. Van Breda Coll.

CAVARIA, von Hagenow, 1851.

[Bry. Maastr. Kr. p. 53.]

SYNONYM.

Cavarinella, Marsson, 1887.

DIAGNOSIS.

Petaloporidæ with hollow stems; the axial cavity is divided into compartments by series of tabulæ. Apertures usually irregular in arrangement. The zoœcia are crowded. Maculæ irregularly arranged.

TYPE SPECIES.

Cavaria ramosa, von Hagenow, 1851. Bry. Maastr. Kr. p. 53, pl. vi. fig. 1.

AFFINITIES.

The value of this genus appears doubtful. D'Orbigny, Hamm, and Marsson include it among the genera with simple tubular zoœcia, although von Hagenow placed it next to *Ceriopora*. The former course seems to me the better. Hamm describes the axial cavity of *C. pustulosa* as due simply to the growth of an encrusting Bryozoan round a soft stem; but Marsson's figures, as well as some British Museum specimens, show that this view is untenable.

Cavaria ramosa, von Hagenow, 1851.

SYNONYMY.

Cavaria ramosa, von Hagenow, 1851. Bry. Maastr. Kr. p. 53, pl. vi. fig. 1.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 25.
Cavarinella ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 19, pl. i. fig. 6.
Cavaria irregularis, d'Orbigny, 1854. Bry. Crét. p. 797.

DIAGNOSIS.

Zoarium of thick or thin stems, which branch dichotomously. Apertures sometimes in irregular transverse series or quite irregularly scattered. Maculæ few in number, in circles round the apertures.

DISTRIBUTION.

Senonian—Maastrichtian: Maastricht; Falkenberg; Bemelen.
Campanian: Rügen.

Figure.

Fig. 54. Longitudinal section of a branch, × 11 dia. Maastrichter Kreide: Maastricht. Busk Coll. **D. 7090.**

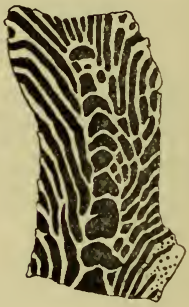

Fig. 54.—*Cavaria ramosa*, Hag. Longitudinal section.

LIST OF SPECIMENS.

D. 1351. A thin branch (on slide). Maastrichter Kreide. Maastricht. Vine Coll. Apparently identified by Pergens.
D. 6394. Six fragments (on slide). Maastrichter Kreide. Bemelen. Busk Coll.
D. 7090. Transverse and longitudinal sections (on slides). Maastrichter Kreide. Maastricht. Busk Coll. Fig. 54.
D. 6392. A fragment, on slide with *Retecava carinata* (Röm.). Maastrichter Kreide. Maastricht. Busk Coll.
D. 3721. Two fragments (in tube). Maastrichter Kreide. Maastricht. Gamble Coll.
D. 3775. A fragment (on slide). Maastrichter Kreide. Falkenberg. Gamble Coll.
D. 6306. A thin fragment (on slide). Mucronatenkreide. Rügen. Laur Coll.
D. 6282. A branch (on slide). Mucronatenkreide. Rügen. Laur Coll.

DOUBTFUL AND UNREPRESENTED SPECIES.

1. ? **hagenowi,** Kade, 1852.

Syn. *Cavaria hagenowi,* Kade, 1852. Los. Verst. Schanzenb. p. 32.

Char.—Thin, cylindrical stems with spiral apertures and longitudinal furrows.

Distrib.—Drift: Schanzenberg, North Germany.

2. ? **heteroporacea,** Kade, 1852.

Syn. *Cavaria heteroporacea,* Kade, 1852. Los. Verst. Schanzenb. p. 32.

Char.—Thick branched stems: on one surface there are large and small apertures.

Distrib.—Drift: Schanzenberg, North Germany.

3. **micropora**, von Hagenow, 1851.

SYN. *Cavaria micropora*, von Hagenow, 1851. Bry. Maastr. Kr. p. 54, pl. vi. fig. 3.
,, ,, Kade, 1852. Los. Verst. Schanzenb. p. 32.
,, ,, d'Orbigny, 1854. Bry. Crét. p. 798.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 25.

CHAR.—Zoarium of thick, cylindrical stems, with apertures well spaced. The intertabular chambers are low, the tabulæ being crowded.

DISTRIB.—Senonian—Maastrichtian: Maastricht.

AFF.—D'Orbigny suggests that this Bryozoan is only a worn form of that which von Hagenow described as *C. pustulosa* (for which see p. 137).

ATAGMA, Lonsdale, 1850.

[Dixon, Geol. Suss. p. 311.]

SYNONYMS.

Ceriopora, pars, Michelin, 1843.
Reptomulticlausa, d'Orbigny, 1853.
Ditaxia, pars, Pergens, 1890.

DIAGNOSIS.

Petaloporidæ with dendroid zoarium formed of an axial bundle covered with several lamellæ.

Apertures distributed irregularly; either over the whole surface, in transverse groups separated by bands without apertures, or in loose groups.

Maculæ variable in development; ranging from single circular series to broad bands.

TYPE SPECIES.

Atagma lonsdalei, n.sp. Syn. *Atagma papularia*, Lonsdale, *non* (Mich.). Chalk: Sussex.

AFFINITIES.

This genus is a Petaloporid with an Inversarian habit of growth. It differs from the French species which Lonsdale assigned to it, as that has dactylethræ and hollow solid stems.

1. **Atagma lonsdalei**, nov.

SYNONYMY.

Atagma papularia (*non* Mich.), Lonsdale, 1850. Dixon, Geol. Suss. p. 311, pl. xviii. B, fig. 6.

DIAGNOSIS.

Zoarium large; the branches are long, dividing at distant intervals, and irregularly. The surface is uneven and nodular. There is a small axial bundle surrounded by one or more lamellæ. At the distal ends the apertures are uniformly scattered, but in the basal portions they occur in groups round smooth, nodular prominences.

Maculæ in single circles round the apertures.

Apertures often with a straight lower edge.

DIMENSIONS.

Height of zoarium	110	mm.
Diameter of branches	3–5	,,
Diameter of aperture	·12–·15	,,
Diameter of zoœcia	·25–·3	,,

DISTRIBUTION.

Lower Chalk: Sussex.

LIST OF SPECIMENS.

30,864. A large branched zoarium. Lower Chalk. Sussex. Dixon Coll. Figd. Lonsdale, Geol. Suss. pl. xviii. B, fig. 6.

B. 4472, B. 4473, B. 4474, B. 4475, B. 4476. Five fragments from the Lower Chalk, Sussex. Figured by Lonsdale, *op. cit.* pl. xviii. B, figs. 6*a–g*.

2. Atagma papularia (Michelin), 1843.

SYNONYMY.

Ceriopora papularia, Michelin, 1843–5. Icon. Zooph. pp. 124, 206, pl. xxxii. fig. 7.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 184.
,, ,, Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 210.
non Reptomulticlausa papularia, d'Orbigny, 1853–4. Bry. Crét. p. 901, pl. 767, figs. 11–14.
Ditaxia (*Reptomulticlausa*) *papularia*, Pergens, 1890. Revision, p. 337.

DIAGNOSIS.

Zoarium of stout branches, which anastomose repeatedly. The surface is nodular.

Apertures circular; irregularly distributed close or distant, separated by wide cancellous areas or by a single circle of maculæ.

Dimensions.

Height of zoarium	90	mm.	
Diameter of branches	5–7	,,	
Diameter of zoœcia	·3	,,	
Diameter of aperture	·06–·07	,,	(*fide* Pergens).

Distribution.

Cenomanian: Vaches noires and Dives, Calvados.

LIST OF SPECIMENS.

60,248. A zoarium 60 mm. high. Cenomanian: Craie chloritée. Vaches noires. Tesson Coll.

60,249. A zoarium. Cenomanian. Dives. Tesson Coll.

DOUBTFUL GENUS.

REPTOCAVEA, d'Orbigny, 1854.

[Bry. Crét. p. 954.]

Diagnosis.

Cyclostomata Cancellata (?) with an irregular, encrusting, unilaminar zoarium.

Type Species.

Reptocavea rugosa, d'Orbigny, 1853–4. Neocomian: Switzerland.

Affinities.

This genus may be the *Berenicea* stage of the Petaloporidæ, representing a simple unilaminar *Atagma* without its axial bundle. In that case the diagnosis of the Petaloporidæ must be modified to receive it; but microscopic study is necessary for the determination of its affinities.

rugosa, d'Orbigny, 1853–4.

Syn. *Reptocavea rugosa*, d'Orbigny, 1853–4. Bry. Crét. p. 955, pl. 775, figs. 16, 17.
,, ,, Pergens, 1890. Revision, p. 338.

Char.—A large, very irregular, nodular zoarium. Zoœcia crowded. Peristomes elevated. Maculæ numerous; ? sometimes petaloporoid in arrangement.

Distrib.—Neocomian: Sainte-Croix, Switzerland.

Suborder DACTYLETHRATA.

[Cat. Jur. Bry. 1896, p. 39.]

Diagnosis.

Cyclostomata with a zoarium formed of long, cylindrical zoœcia, often tabulate, separated by aborted zoœcia or dactylethræ. No cancelli, mesopores, or avicularia.

Affinities.

The members of this suborder differ from the Cancellata by having solid, non-cancellous walls to the zoœcia, and by having dactylethræ between the zoœcia. They differ from *Heteropora* by the absence of mesopores; but the living species referred to *Heteropora* probably belong to this group. The Trepostomata are more massive, and have more prismatic, densely packed zoœcia.

Family CLAUSIDÆ, d'Orbigny, 1854.

Diagnosis.

Dactylethrata with an adnate or erect zoarium, and with the zoœcia distributed uniformly. Dactylethræ in circles round the peristomes.

CRYPTOGLENA, Marsson, 1887.

[Bry. Rüg. : Pal. Abh. vol. iv. p. 16.]

Diagnosis.

Clausidæ with adnate, thick, unilaminar zoarium.

Type Species.

Cryptoglena adspersa, Marsson, 1887. Campanian : Rügen.

Cryptoglena gamblei, nov.

Diagnosis.

Zoarium irregularly lobed. The surface marked by radial ridges. Apertures subquincuncial in arrangement; crowded. Peristomes well raised. Apertures separated by a single series of dactylethræ.

DISTRIBUTION.

Middle Chalk: Chatham.

FIGURES.

Pl. XVII. Fig. 7*a*, a zoarium, nat. size; and Fig. 7*b*, part of it, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4064.**

Pl. XVII. Fig. 9. A zoarium, × 2 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4260.**

LIST OF SPECIMENS.

D. 4064. The type-specimen. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVII. Fig. 7.

D. 4260. Another zoarium. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVII. Fig. 9.

UNREPRESENTED SPECIES.

adspersa, Marsson, 1887.

SYN. *Cryptoglena adspersa*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 16.

CHAR.—Zoarium with well-raised, irregularly distributed, scattered peristomes. Surface smooth. Walls of the zoœcia nodular.

DISTRIB.—Campanian: Rügen.

CLAUSIMULTELEA, d'Orbigny, 1853.

[Bry. Crét. p. 655.]

DIAGNOSIS.

Clausidæ with adnate, massive multilamellar zoaria.

TYPE SPECIES.

Clausimultelea tuberculata, d'Orbigny, 1853. Senonian: France.

UNREPRESENTED SPECIES.

tuberculata, d'Orbigny, 1853.

SYN. *Clausimultelea tuberculata*, d'Orbigny, 1853. Bry. Crét. p. 656, pl. 784, figs. 12–15.
„ „ Pergens, 1890. Revision, p. 398.
Diastopora „ Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 509.

CHAR.—Apertures distant, oval; dactylethræ large, angular, in single series.

DISTRIB.—Senonian: Tréquerville, Seine-Inférieure.

DITAXIA, von Hagenow, 1851.

Synonyms.

Ceriopora, pars, Goldfuss, 1827.
Heteropora, pars, de Blainville, 1834.
Polytaxia, Hamm, 1881.
? *Semierescis*, d'Orbigny, 1853.
Mesenteripora, pars, Ubaghs, 1879.

Diagnosis.

Clausidæ with an erect, lamellar, frondose zoarium.

Type Species.

Ceriopora anomalopora, Goldfuss, 1827. Maastrichtian: Maastricht.

Ditaxia anomalopora (Goldfuss), 1827.

Synonymy.

Ceriopora	*anomalopora*,	Goldfuss, 1827. Petref. Germ. vol. i. p. 33, pl. x. figs. 5*e*, *d* (*non a*, *b*).
,,	,,	Morren, 1829. Cor. foss. Belg.: Ann. Acc. Groning. 1829, p. 38.
,,	,,	Klöden, 1834. Verst. Brand. p. 263.
,,	,,	von Hagenow, 1839. Mon. Rüg.: N. Jahrb. 1839, p. 282.
Heteropora	,,	de Blainville, 1830. Zooph.: Dict. Sci. nat. vol. lx. p. 382.
,,	,,	de Blainville, 1834. Man. Act. p. 417.
,,	,,	Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 208.
Ditaxia	,,	von Hagenow, 1851. Bry. Maastr. Kr. p. 49, pl. iv. fig. 9.
,,	,,	d'Orbigny, 1853–4. Bry. Crét. p. 953, pl. 775, figs. 7–15.
,,	,,	Pergens, 1890. Revision, p. 337.
Polytaxia	,,	Hamm, 1881. Bry. mastr. Ob.-Sen. p. 41.
Mesenteripora	,,	Staring, 1860. Bod. Nederl. vol. ii. p. 402.
,,	,,	Ubaghs, 1879. Géol. Pal. Limbourg, p. 223.

Diagnosis.

Zoarium with very prominent zoarial lamina. It grows in broad sheets or dichotomous fronds. Apertures irregularly scattered; large and circular. Dactylethræ usually in single series, but in places collected into large groups. Below, the zoœcia become polygonal and closed.

DISTRIBUTION.

Senonian—Maastrichtian: Maastricht; Geulem; Bemelen; Meudon; Royan.
Santonian: Saintes, etc., Charente-Inférieure.
Coniacian: Tours, Maune, and Joué, Indre-et-Loire.
Turonian or Coniacian: Vendôme, Villavard, Lavardin, etc., Loir-et-Cher.

LIST OF SPECIMENS.

D. 6456.	Two specimens (on slide). Maastrichter Kreide. Bemelen. Busk Coll.
D. 3763.	Two specimens (on slide). Maastrichter Kreide. Geulem. Gamble Coll.
D. 3340.	A broad frond. Maastrichter Kreide. Maastricht. Van Breda Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. ?**cretacea** (von Hagenow), 1851.

SYN. *Neuropora cretacea*, von Hagenow, 1851. Bry. Maastr. Kr. p. 48, pl. iii. fig. 10.
Polytaxia ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 41.

DISTRIB.—Maastrichtian: Maastricht. ? Cenomanian: Essen.

AFF.—This may be a coral (non-madreporarian). Hamm includes as synonyms the *Filicava trigona* of Goldfuss and Simonowitsch and *Filicava triangularis* of d'Orbigny. Microscopic examination is necessary.

2. **biseriata**, Pocta, 1892.

SYN. *Ditaxia biseriata*, Pocta, 1892. Mech. Koryc. Hory: Ceska Ak. Fr. Jos. Praze, sect. ii. p. 25, fig. 16, pl. iv. figs. 3, 4.

DISTRIB.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

AFF.—Probably a new genus of Petaloporidæ.

3. ?**multicincta**, von Reuss, 1872–3.

SYN. *Ditaxia multicincta*, von Reuss, 1872–3. Bry. unt. Quad.: Palæontogr. vol. xx. pt. 1, p. 131, pl. xxxii. figs. 13–19.

CHAR.—Branches narrow dichotomous fronds. Apertures large, oval. Dactylethræ (? maculæ) in a single circle round each aperture, or more numerous.

DISTRIB.—Cenomanian: Plauen, Saxony.

4. **tubulosa** (d'Orbigny), 1853.

SYN. *Semicrescis tubulosa*, d'Orbigny, 1853–4. Bry. Crét. p. 1073, pl. 799, figs. 8–10.
Ditaxia ,, Pergens, 1890. Revision, p. 337.

CHAR.—A hollow, tubular zoarium. Apertures regularly arranged. Dactylethræ mostly in single series round each aperture.

DISTRIB. — Senonian — Maastrichtian: Sainte-Colombe, Manche; Royan, Charente-Inférieure.

AFF.—Included here *fide* Pergens. From d'Orbigny's figures it is not certain whether there are dactylethræ or maculæ.

CLAUSA, d'Orbigny, 1854.

[Bry. Crét. p. 893.]

SYNONYMS.

Ceriopora, pars, d'Orbigny, 1850.
Pustulipora, pars, von Hagenow, 1851.
Entalophora, pars, d'Orbigny, 1851.
Claviclausa, d'Orbigny, 1854.
Heteropora, pars, Pergens, 1890.
Stigmatopora, pars, Hamm, 1881.

DIAGNOSIS.

Clausidæ with an erect dendroid zoarium formed of a single bundle of zoœcia.

TYPE SPECIES.

Ceriopora heteropora, d'Orbigny, 1850. Cenomanian to Senonian: France.

AFFINITIES.

This genus falls into two groups of species—those with thin stems and narrow zoœcia and dactylethræ, and those with much broader zoœcia and dactylethræ and often clavate stems. The latter includes the genus *Claviclausa*. The genus differs from *Multiclausa* as *Meliceritites* differs from *Inversaria*.

1. Clausa heteropora (d'Orbigny), 1850.

SYNONYMY.

Ceriopora	*heteropora*,	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 184.
Clausa	,,	d'Orbigny, 1853–4. Bry. Crét. p. 894, pl. 776, figs. 1–4.
Claviclausa	*clava*,	*pars*, d'Orbigny, 1853. Bry. Crét. pl. 765, fig. 5 (*non* p. 890, pl. 620, figs. 4–6).
Heteropora	,,	*pars*, Pergens, 1890. Revision, p. 370.
,,	,,	*pars*, Canu, 1897. Bry. Jan.: Bull. Soc. géol. France, ser. 3, vol. xxv. p. 153.
,,	,,	*pars*, Canu, 1897. Bry. St. Cal.: *ibid.* p. 747.
Entalophora	,,	Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 507.
Clausa	*compressa*,	d'Orbigny, 1853–4. Bry. Crét. p. 895, pl. 766, figs. 5–8.
Heteropora	,,	Pergens, 1890. Revision, p. 373.

Entalophora micropora, d'Orbigny, 1851. Bry. Crét. pl. 624, figs. 1–3.
Clausa ,, d'Orbigny, 1853–4. *Ibid.* p. 896, pl. 766, fig. 9.
Heteropora ,, Pergens, 1890. Revision, p. 373.
,, ,, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 208.
Entalophora punctata, d'Orbigny, 1851. Bry. Crét. pl. 623, figs. 4–7.
Laterocavea ,, *pars*, d'Orbigny, 1853–4. *Ibid.* p. 993; *non* pl. 772, figs. 15–17.
Entalophora obliqua, d'Orbigny, 1851. Bry. Crét. pl. 623, figs. 18–21.
Clausa ,, d'Orbigny, 1854. *Ibid.* p. 895.
Heteropora ,, Pergens, 1893. *Op. cit.* p. 208.
,, ,, Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 747.
Heteropora (*Clausa*) *obliqua*, Pergens, 1890. Revision, p. 373.

Diagnosis.

Zoarium of cylindrical or compressed branches, which divide dichotomously. The branches end bluntly, and are not prolonged into barren, narrow stems without apertures.

Apertures crowded, usually arranged in close spirals, and quincuncial, or somewhat irregular in distribution (in forms *micropora* and *reticulata*). External surface of the zoarium smooth or punctate, or marked by faint radial ribs.

Dimensions.

	Fide Pergens.		
	compressa	*micropora*	B.M., D. 2711.
Diameter of branch	—	—	·9 mm.
Diameter of zoœcia	—	—	·2 ,,
Diameter of aperture	·08	·08	·08–·1 ,,

Distribution.

England:

Middle Chalk: Chatham.

Foreign:

Senonian—Maastrichtian: Meudon; Sainte-Colombe, Manche; Royan.
Campanian: Rügen.
Santonian: Saintes, etc., Charente-Inférieure.
Coniacian: Vendôme, Loir-et-Cher; Tours, Joué, and Luynes, Indre-et-Loire.
Coniacian or Turonian; Villavard, Lavardin, Les Roches, Sougé, etc., Loir-et-Cher.
Turonian: Sainte-Maure, Indre-et-Loire; St. Germain d'Arcé, Sarthe; Merpins, Charente; Montoire, Villardin, St. Rimay.
Cenomanian: Le Mans and Janières, Sarthe; Villers, Calvados.

FIGURES.

Pl. XIII. Fig. 15. A branch, × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 2711.**

Pl. XVII. Fig. 11. A branch of var. *obliqua*, in which the radial ribs are faintly visible in only the lower part; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 699.**

Fig. 55. A longitudinal section, × 9 dia. Senonian—Coniacian: Luynes. **D. 4649.**

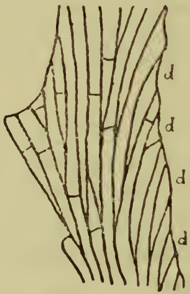

FIG. 55.—*Clausa heteropora* (Orb.). Longitudinal section. (*d* = dactylethræ.)

AFFINITIES.

This species is the earliest of the genus *Clausa*, and the typical forms of it come from the Cenomanian; but a practically identical form is common in the Craie de Villedieu and Craie marneuse of Touraine. In d'Orbigny's original figures of his *E. punctata* and *E. obliqua* the zoarium is represented as strongly punctate; but this appears to have been an error of the artist, for the surface is described as smooth when perfect, and as otherwise showing "les cellules avortées" and not pores (p. 896).

Pergens includes the *C. heteropora* as a synonym of *Claviclausa clava* and *Cavea elongata*; but the Museum specimens and d'Orbigny's figures render it probable that the last names are synonymous, and refer to a species of *Petalopora*; whereas *C. heteropora* is a true *Clausa*, with regular, spiral apertures. It would be better to adopt the name *obliqua*, as the variety is commoner than the Cenomanian type, but the name *heteropora* has prior claim, dating from the "Prodrome"; its original description is no doubt inadequate, and it can only be recognized from the figures issued in 1853; but the use of the name *obliqua* prior to that date is equally unsatisfactory, for it was only published as the title of some erroneous and misleading figures.

LIST OF SPECIMENS.

BRITISH.

D. 2711. A Y-shaped fragment (on slide). Middle Chalk. Chatham. Vine Coll. Fig. Pl. XIII. Fig. 15.

D. 699. A specimen of var. *obliqua*, partly smooth and partly ribbed. Middle Chalk. Chatham. Vine Coll. Figd. Pl. XVII. Fig. 11.

FOREIGN.

D. 4703. A thin branch of form *micropora* (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4637. A small fragment of var. *obliqua* (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4636. A stem of var. *obliqua* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4638, D. 4665. Two branched fragments of var. *obliqua* (on slides). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4650. A branch of var. *obliqua* (on slide with a *Petalopora*). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4639. A fragment of var. *obliqua* (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4640. A thin stem of var. *obliqua* (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4641. A branched fragment of var. *obliqua* (on slide). Senonian. St. Mathurin, Marne-et-Loire. Purchased 1898.

D. 4651. A fragment of var. *obliqua* (on slide). Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4645. Five fragments of var. *obliqua* (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4646. Eight small fragments (on slide). Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4647. A branched fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4648. Seven fragments (on slide). Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898.

D. 4649. Ten small fragments (on slide). Senonian: Craie de Villedieu. Luynes, Indre-et-Loire. Purchased 1898. Section figd. No. 55, p. 410.

D. 4692. A long thin branch of var. *micropora* (on slide). Turonian: Craie marneuse. St. Rimay. Purchased 1898.

D. 4661. A fragment of var. *micropora* (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4663. A small fragment of var. *micropora* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 4662. A fragment of var. *micropora* (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4664. A branched fragment of var. *micropora* (on slide). Turonian: Craie marneuse. Villardin, Loir-et-Cher. Purchased 1898.

D. 3767. A fragment of var. *obliqua* (on slide). Coniacian or Turonian: Sougé, Loir-et-Cher. Gamble Coll.

2. Clausa francqana, d'Orbigny, 1853.

SYNONYMY.

Clausa	*francqana,*	d'Orbigny, 1853. Bry. Crét. pl. 766, figs. 13–15.
,,	,,	d'Orbigny, 1854. *Ibid.* p. 898.
,,	,,	Pergens, 1890. Revision, p. 375.
Heteropora	,,	Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 311.
,,	,,	Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 512.

DIAGNOSIS.

Zoarium of thin, cylindrical branches, which divide dichotomously. The branches end in long, thin prolongations, which are much narrower than the branches and have no apertures. The zoarium is ornamented by radial ribs.

Peristomes of medium height.

Apertures usually distant in an open spiral; but in older parts of the zoarium they are crowded and arranged in a compact spiral.

DIMENSIONS.

	D. 433.
Diameter of branch	1 mm.
Diameter of zoœcia	·25–·35 ,,
Diameter of apertures	·08–·1 ,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Bromley; Gravesend.
Middle Chalk: Chatham.

FOREIGN:

Senonian?: North of France.
Turonian: Strehlen, Saxony, in Upper Pläner.

FIGURES.

Pl. XIII. Fig. 8. Part of a branch with bare proximal end; × 10 dia. Upper Chalk: Kent. Simmons Coll. **40,363.**

Pl. XIII. Fig. 9. Part of a fusiform branch with a short bare end; × 8 dia. Chalk: South of England. Toulmin Smith Coll. **D. 4564.**

Pl. XIII. Fig. 10. Upper part of a zoarium with a bare distal end; × 10 dia.: the figure is inverted. Middle Chalk: Chatham. Gamble Coll. **D. 433.**

Pl. XIII. Fig. 11. A branched zoarium with bare proximal end; × 9 dia. Upper Chalk: Bromley. Simmons Coll. **D. 2840.**

Pl. XIII. Fig. 12. A thin branch with long, narrow, bare proximal end; × 10 dia. Middle Chalk: Chatham. Vine Coll. **D. 2720.**

Pl. XIII. Fig. 13. The distal end of a zoarium, with gonocyst; × 10 dia. Middle Chalk: Chatham. Gamble Coll. **D. 437.**

Fig. 56. A transverse section, × 40 dia. Middle Chalk: Chatham. **D. 4567.**

Fig. 57. A longitudinal section, × 12 dia. Middle Chalk: Chatham. **D. 4568.**

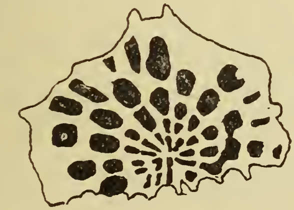

Fig. 56.

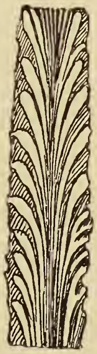

Fig. 57.

Clausa francqana, Orb. Transverse and longitudinal sections.

Affinities.

The species differs from *C. heteropora* by the well-developed areas without apertures. The narrow bare stems of this species occur at one or both ends of the branches. They are usually at the proximal end (as in **D. 437**); but their occurrence at the distal end is shown by **D. 433** (Pl. XIII. Fig. 10), in which the direction of the broken branch orientates the specimen.

LIST OF SPECIMENS.

40,363. A branch 7 mm. long with the zoœcia in an open spiral. Upper Chalk. Kent. Simmons Coll. Figd. Pl. XIII. Fig. 8.

D. 4564. A fusiform zoarium with a short bare end and apertures in a regular spiral. Upper Chalk. S.E. England. Toulmin Smith Coll. Figd. Pl. XIII. Fig. 9.

D. 433. Three fragments of zoarium with spindle-shaped branches. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIII. Fig. 10.

D. 2840. Two specimens (on slide). Upper Chalk. Bromley. J. Simmons Coll. Figd. Pl. XIII. Fig. 11.

D. 2720. A branch with an unusually long barren end, which is 3·5 mm. in length (on slide). Middle Chalk. Chatham. Vine Coll. Figd. Pl. XIII. Fig. 12.

D. 437. Three branches (on slide), with long barren base and terminal gonocyst. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XIII. Fig. 13.

D. 4567. The transverse section across a branch (on slide). Middle Chalk. Chatham. Figd. No. 56, p. 413.

D. 4568. A thin longitudinal section across part of the same specimen as the last (on slide). Middle Chalk. Chatham. Figd. No. 57, p. 413.

D. 990. Five small worn fragments (on slide). Upper Chalk. Gravesend. Collected by Professor T. R. Jones. Vine Coll.

D. 991. A small worn fragment (on slide). Upper Chalk. Gravesend. Vine Coll.

D. 992. Three fragments, one with well-developed distal end (on slide). Upper Chalk. Gravesend. Vine Coll.

D. 993. Seven fragments (on slide). Upper Chalk. Gravesend. Vine Coll.

D. 3130. A branch with distant apertures (on slide). Upper Chalk. Kent. J. Simmons Coll.

D. 4345. A branched zoarium showing a sudden change from regular spiral with twelve apertures in each whorl to a loose open spiral with seven apertures in the whorl. In the latter part of the zoarium the radial ribbing is well developed. Middle Chalk. Chatham. Gamble Coll.

D. 494. A branched fragment on flint. Middle Chalk. Chatham. Gamble Coll.

D. 482. Three well-developed specimens with spiral apertures. Middle Chalk. Chatham. Gamble Coll.

D. 2841. Five specimens (on slide). Upper Chalk. Bromley. J. Simmons Coll.

D. 352. Four specimens (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 690. Three specimens of the regularly spiral form, one with long barren end (on slide). Middle Chalk. Chatham. Vine Coll., No. 60. Recorded by Vine as *Heteropora francqana.*

D. 691. Three specimens of the same form (on slide). Middle Chalk. Chatham. Vine Coll.

D. 2760. A small fragment (on slide). Middle Chalk. Chatham. Vine Coll.

D. 692. Two fragments (on slide). Middle Chalk. Chatham. Vine Coll., No. 61. Recorded by Vine as *Heteropora francqana.*

D. 4565. A branched zoarium with well-preserved narrow distal end and rather high peristomes (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4566. A branch (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4169. A branch with *Entalophora linearis*, Orb. (on flint). Middle Chalk. Chatham. Gamble Coll.

D. 699. Three branches (on slide). Middle Chalk. Chatham. Vine Coll.

D. 723. One branch (on slide). Middle Chalk. Chatham. Vine Coll.

D. 4569. Longitudinal section (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4941. A fragment with basal part of stem (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4070. Eight fragments (on slide), with *Clausa carantina*; Nos. 1, 2, 4, and 5. Middle Chalk. Chatham. Gamble Coll.

3. **Clausa irregularis** (d'Orbigny), 1850 (*pars* 1851 and *pars* 1854).

SYNONYMY.

Entalophora	*irregularis,*	d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
,,	,,	d'Orbigny, 1851. Bry. Crét. pl. 624, figs. 9–12.
non ,,	,,	d'Orbigny, 1851. *Ibid.* pl. 617, figs. 5–7.
,,	,,	Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.
Clausa	,,	d'Orbigny, 1853–4. Bry. Crét. p. 897, pl. 766, figs. 10–12.
non Sparsicavea	,,	d'Orbigny, 1854. *Ibid.* p. 949.
non ,,	,,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 26, pl. ii. fig. 6.
Heteropora	,,	Pergens, 1890. Revision, p. 373.
,,	,,	Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 208.
,,	,,	Vine, 1893. Compl. Rep.: Rep. Brit. Assoc. 1892, p. 311.
,,	,,	Canu, 1897. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 747.
,,	*crassa*	von Hagenow, 1851. Bry. Maastr. Kr. p. 46, pl. v. figs. 12, 13.
non ,,	,,	Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 26, pl. ii. fig. 5.
,,	,,	Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.

DIAGNOSIS.

Zoarium of cylindrical, dichotomous branches, with distant, irregularly arranged apertures. Peristomes raised to medium height. The superficial ornamentation is faint. Dactylethræ in a circle round the peristomial portion of the zoœcia.

DIMENSIONS.

	B.M., D. 2651.
Diameter of branch	·8 mm.
Diameter of zoœcia	·16 ,,
Diameter of aperture	·08 ,,

DISTRIBUTION.

ENGLAND:

Upper Chalk: Salisbury.

FOREIGN:

Senonian—Maastrichtian: Maastricht; Royan, Charente-Inférieure.
Campanian: Rügen.
Coniacian: St. Christophe, Indre-et-Loire; Les Roches, Loir-et-Cher.
Coniacian? or Turonian: Villavard, Lavardin, Lisle, etc., Loir-et-Cher.
Turonian—Angoumian: Villardin, Les Roches, and Montoire, Loir-et-Cher.

FIGURES.

Pl. XIII. Fig. 16. A branch, × 10 dia. Upper Chalk: Salisbury. Vine Coll. **D. 2651.**

Fig. 58. Longitudinal section of a branch, × 7 dia. Turonian—Craie marneuse: Villardin Station, Loir-et-Cher. **D. 4644.**

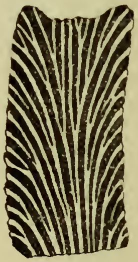

FIG. 58.—*Clausa irregularis* (Orb.). Longitudinal section.

LIST OF SPECIMENS.

BRITISH.

D. 2651. Two fragments (on slide). Upper Chalk. Salisbury. Vine Coll., No. 59. Figd. Pl. XIII. Fig. 16.

FOREIGN.

D. 4705. A branched fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4704. A branch (on slide). Turonian: Craie marneuse: Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4877. No. 2 (on slide). Turonian: Craie tuffeau. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4657. Three fragments (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4642. A branch, somewhat laterally compressed (on slide). Turonian: Craie marneuse. North of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4643. A branched fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4654. A small fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4659. A small fragment (on slide). Turonian: Craie marneuse. Montoire, Loir-et-Cher. Purchased 1898.

D. 4658. A fragment (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4644. Three fragments and a slide cut from one of the same (on slides). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898. Section figd. No. 58, p. 416.

D. 4653. A branch and a thin longitudinal section (on slide). Turonian: Craie marneuse. Villardin Station, Loir-et-Cher. Purchased 1898.

D. 4655. Three fragments (on slide). Turonian: Craie tuffeau. Villardin, Loir-et-Cher. Purchased 1898.

D. 4656. A branched fragment showing the blunt ends of the branches (on slide). Senonian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 4652. A fragment (on slide). Senonian: Craie de Villedieu. South of Les Roches, Loir-et-Cher. Purchased 1898.

D. 6305. A thin specimen of var. *crassa*. Mucronatenkreide. Rügen. Laur Coll.

D. 6281. Three fragments (on slide). Mucronatenkreide. Rügen. Laur Coll.

4. **Clausa variabilis** (von Hagenow), 1851.

SYNONYMY.

Pustulipora variabilis,		von Hagenow, 1851. Bry. Maastr. Kr. p. 19, pl. i. fig. 9.
,, ?	,,	Kade, 1852. Los. Verst. Schanzenb. p. 31.
Entalophora	,,	Pergens, 1888. Age tuf. Ciply: Bull. Soc. belge Géol. vol. i. p. 205.
Stigmatopora	,,	Hamm, 1881. Bry. mastr. Ob.-Sen. p. 46.
Pustulipora	*dubia,*	von Hagenow, 1851. *Op. cit.* p. 19, pl. i. fig. 10.
Meliceritites	,,	Staring, 1860. Bod. Nederl. vol. ii. p. 396.
,,	,,	Ubaghs, 1879. Géol. Pal. Limbourg, p. 222.

DIAGNOSIS.

Zoarium of cylindrical branches, composed of numerous zoœcia. Apertures crowded, quincuncial, spiral or subspiral, and in places somewhat irregular. The apertures are circular, or the lower edge may be straight. Dactylethræ few and scattered. Below the aperture is a depression or facet. The surface of the zoarium may be marked into lozenge-shaped areas by the interzoœcial sutures.

DIMENSIONS.

Diameter of branch	...	...	...	1–1·5 mm.
Diameter of zoœcia	...	...	...	·2 ,,
Diameter of aperture	...	...	...	·1 ,,

FIGURE.

Fig. 59. Longitudinal section of a branch, × 11 dia. Maastrichter Kreide : Maastricht. Vine Coll. **D. 1379.**

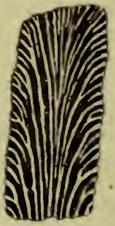

FIG. 59.—*Clausa variabilis* (Hag.). Longitudinal section.

DISTRIBUTION.

Senonian—Maastrichtian : Maastricht ; St. Pierre ; Falkenberg.

AFFINITIES.

This species resembles *C. irregularis* in the characters of the dactylethræ. One of them below the aperture has a tumid covering, which externally appears like a facette, and the species thus presents a certain resemblance to the Eleidæ ; but the longitudinal section (Fig. 59) shows that the zoœcial characters are different.

LIST OF SPECIMENS.

D. 1379. Two fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll. Figd. No. 59.

D. 1382. Three fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 1383. Three fragments (on slide). Maastrichter Kreide. Maastricht. Vine Coll.

D. 3754. Two fragments (on slide). Maastrichter Kreide. Maastricht. Gamble Coll.

D. 6402. Six fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

D. 6446. Three slender fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

D. 6448. Eleven fragments (on slide). Maastrichter Kreide. St. Pierre; Maastricht. Busk Coll.

D. 6452. Two slender fragments (on slide). Maastrichter Kreide. Maastricht. Busk Coll.

5. **Clausa lepida** (Novak), 1877.

SYNONYMY.

Heteropora lepida, Novak, 1877. Bry. böhm. Kr.: Denk. Ak. Wiss. Wien. vol. xxxvii. pt. 2, p. 115, pl. viii. figs. 21–33.

,, ,, Pocta, 1892. Mech. Koryc. Hory: Ces. Ak. Fr. Jos. Praze, sect. ii. p. 24, pl. iv. figs. 21–23; p. 8, fig. 9.

DIAGNOSIS.

Zoarium of thin, dichotomous, cylindrical branches, which end bluntly.

Apertures distant, and in most of the zoarium arranged in regular open spirals; but at the base the apertures are covered by reticular layers, and in places are irregular in arrangement.

Apertures separated by a single or double circle of angular dactylethræ.

Peristomes often well raised.

DIMENSIONS.

Diameter of aperture	... ...	·19–·2 mm.	(*fide* Pocta).
Diameter of maculæ	... ...	·04–·05 ,,	(*fide* Pocta).

DISTRIBUTION.

Cenomanian: Kank, Jiné, Kolin, Zbislav, and Kamajk, Bohemia, in Korycaner Schichten.

AFFINITIES.

This species is closely allied to *C. irregularis*, from which it differs by its more regular arrangement of the peristomes. The characters are illustrated in Pocta's figure (*op. cit.* p. 8, fig. 9, and Pl. IV. Fig. 21).

LIST OF SPECIMENS.

D. 7066. Three fragments with high peristomes (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.
D. 7067. Four fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.
D. 7068. Two fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.
D. 7069. Eleven fragments (on slide). Korycaner Schichten. Kank, Bohemia. Fric Coll.
D. 4437. Two stems. Korycaner Schichten. Zbislav, Bohemia. Fric Coll.

6. **Clausa globulosa** (d'Orbigny), 1853.

SYNONYMY.

Claviclausa globulosa, d'Orbigny, 1853–4. Bry. Crét. p. 891, pl. 765, figs. 10–15.
Heteropora ,, Pergens, 1890. Revision, p. 372.
Claviclausa elegans, d'Orbigny, 1853–4. Bry. Crét. p. 891, pl. 765, figs. 6–9.
Heteropora ,, Pergens, 1890. Revision, p. 372.
Claviclausa francqana, d'Orbigny, 1853–4. Bry. Crét. p. 892, pl. 765, figs. 16, 17.
Entalophora ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 511.

DIAGNOSIS.

Zoarium of a rounded, more or less spherical head, attached by a cylindrical stem. The head is spherical or ovoid, or may be conical. The stem is long and thin or stout; the diameter is uniform or irregular.

Zoœcia long, tubular, and sinuous, and well exposed throughout the stem. Those of the head are crowded and visible only at their ends. The orifices are subquincuncial and regular on the lower half of the head, but crowded and irregularly arranged on the upper surface. In some specimens the point is occupied by a conical projection formed of long zoœcia, the characters of which approximate to those of the stem.

Dactylethræ confined to the head; forming a single series between the adjacent zoœcia.

DIMENSIONS.

	Fide Pergens.	B.M. D. 3089.	B.M. D. 4555.
Diameter of head	—	2·4 mm.	3·5 mm.
Diameter of stem	—	·5 ,,	1·8 ,,
Length of stem	—	11 ,,	18 ,,
Diameter of orifice	·18 mm.	·15–·2 ,,	·2 ,,

DISTRIBUTION.

BRITISH :

Upper Chalk : Bromley ; Croydon ; 'Ludston' (? Ludsdown, west-south-west of Rochester).
Middle Chalk : Chatham.

FOREIGN :

Senonian—Maastrichtian : Meudon ; Fécamp.
Santonian : Saintes, Charente.
Turonian : Angoulême, Charente ; Sainte-Maure, Indre-et-Loire.

FIGURES.

Pl. XVII. Fig. 1*a*, a zoarium of var. *tenuicaulata*, nat. size. Fig. 1*b*, the head of the same specimen. Fig. 1*c*, part of the stem of the same. Upper Chalk : Bromley. Bowerbank Coll. **D. 3089.**

Pl. XVII. Fig. 2*a*, a zoarium of var. *crassicaulata*, nat. size. Fig. 2*b*, the head of the same specimen, × 8 dia. Fig. 2*c*, part of the stem of the same, × 8 dia. Middle Chalk : Chatham. Gamble Coll. **D. 4555.**

Pl. XVII. Fig. 3. Head of another zoarium, × 10 dia. Upper Chalk : S.E. England. Toulmin Smith Coll. **D. 4556.**

Pl. XVII. Fig. 4. Part of another zoarium with highly raised peristomes, × 10 dia. Middle Chalk : Chatham. Gamble Coll. **D. 4563.**

Pl. XVII. Fig. 5. Part of a zoarium of var. *crassicaulata*, with a long free peristome ; × 10 dia. Middle Chalk : Chatham. Gamble Coll. **D. 4559.**

Pl. XVII. Fig. 6. Base of a zoarium of var. *elegans*, × 6 dia. Middle Chalk : Chatham. Gamble Coll. **D. 4100.**

Pl. XVII. Figs. 8*a*, *b*. The base of a zoarium, from above and from the side. Fig. 8*a*, nat. size ; Fig. 8*b*, × 2 dia. Middle Chalk : Chatham. Gamble Coll. **D. 4197.**

Pl. XVII. Fig. 10. A branch from a zoarium of the form *elegans*, × 6 dia. Middle Chalk : Chatham. Vine Coll. **D. 628.**

Fig. 60. A longitudinal section through a specimen of var. *crassicaulata* imbedded in flint; × 12 dia. Upper Chalk: 'Ludston' (? Ludsdown, west-south-west of Rochester). Bowerbank Coll. **D. 4561.**

Fig. 61. A transverse section across a stem of var. *crassicaulata*, × 12 dia. Middle Chalk: Chatham. Gamble Coll. **D. 4119.**

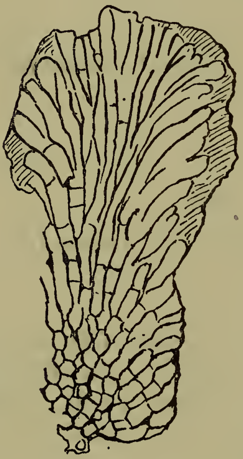

Fig. 60.

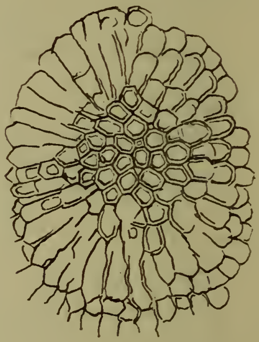

Fig. 61.

Clausa globulosa (Orb.), var. *crassicaulata*. Longitudinal and transverse sections.

LIST OF SPECIMENS.

D. 3089. A long-stalked zoarium, var. *tenuicaulata*. Upper Chalk. Bromley. Bowerbank Coll. Figd. Pl. XVII. Fig. 1.

D. 4555. A zoarium with the stalk long and irregular, var. *crassicaulata*. Middle Chalk. Chatham. Presented by W. Gamble, Esq., 1889. Figd. Pl. XVII. Fig. 2.

D. 4100. A young zoarium growing attached to a stem of *Nodelea durobrivensis*, Greg. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVII. Fig. 6.

D. 4556. The heads of two zoaria. Upper Chalk. S.E. England. Toulmin Smith Coll. Figd. Pl. XVII. Fig. 3.

D. 4119. A specimen in flint, and a slide with a thin transverse section. Middle Chalk. Chatham. Gamble Coll. Transverse section figd. No. 61.

D. 4206. A zoarium 14 mm. long, var. *crassicaulata*, with a stem as thick as the head, but marked by two constrictions. Middle Chalk. Chatham. Gamble Coll.

D. 4078. A zoarium of var. *crassicaulata* with a thick irregular stem similar to the previous specimen. Middle Chalk. Chatham. Gamble Coll.

D. 4172. A thick irregular zoarium of the var. *crassicaulata*. Middle Chalk. Chatham. Gamble Coll.

D. 4173. A specimen of var. *crassicaulata*. Middle Chalk. Chatham. Gamble Coll.

D. 3106. A branched zoarium of var. *crassicaulata*, with the peristomes in one part highly raised. Chalk. Loc.? Bowerbank Coll.

D. 4115. A branched zoarium of var. *crassicaulata* and two fragments cut to show transverse section. Middle Chalk. Chatham. Gamble Coll.

D. 471. A branched zoarium of var. *crassicaulata*, showing longitudinal section. Middle Chalk. Chatham. Gamble Coll.

D. 4557. A zoarium mostly imbedded in flint. Middle Chalk. Chatham. Presented by Wm. Gamble, Esq., 1889.

D. 4183. Two zoaria in flints, var. *crassicaulata*. Middle Chalk. Chatham. Gamble Coll.

D. 4558. Head of a zoarium, on flint, associated with various Cheilostomata. Middle Chalk. Chatham. Presented by Wm. Gamble, Esq., 1889.

D. 468. Two zoaria on flints; the better preserved is a branched form of *crassicaulata*. Middle Chalk. Chatham. Gamble Coll.

D. 4559. A cylindrical, rather thin, stalked form of *crassicaulata*. Middle Chalk. Chatham. Gamble Coll. The specimen has one zoœcium with a free peristome 1·5 mm. long. Figd. Pl. XVII. Fig. 5.

D. 4660. Two zoaria in flint, var. *crassicaulata*. Middle Chalk. Chatham. Presented by Wm. Gamble, Esq., 1889.

D. 3057. An irregular specimen of var. *crassicaulata*. Middle Chalk. Chatham. Presented by Wm. Gamble, Esq., 1889.

56,355. A head of a zoarium on flint. Upper Chalk. Croydon. J. Simmons Coll.

D. 4560. A zoarium of var. *crassicaulata*. Middle Chalk. 'Ludston' (? Ludsdown, west-south-west of Rochester). Bowerbank Coll.

D. 4561. A thin, longitudinal section, cut from a fragment of the previous specimen. Figd. No. 60, p. 422.

D. 4049. Three zoaria of var. *crassicaulata* (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 4562. The head of a zoarium (on slide). Middle Chalk. Chatham. Vine Coll. Identified by Vine as *Meliceritites dollfusi*.

D. 2729. The heads of two zoaria (on slide). Middle Chalk. Chatham. Vine Coll.

D. 629. Part of a branched zoarium of var. *crassicaulata* (on slide). Middle Chalk. Chatham. Vine Coll., No. 106. Identified by Vine as *Meliceritites*, sp.

D. 360. Three specimens (on slide); two show internal structure. Middle Chalk. Chatham. Gamble Coll.

D. 2629. A zoarium of var. *tenuicaulata*, but with a stouter, less regular stem than the typical form of that variety. Upper Chalk. Salisbury. Vine Coll., No. 82.

50,457. A fragment of var. *crassicaulata*. Upper Chalk. Archcliff Cave, Dover. Morris Coll.

D. 628. Part of the head of a specimen, with an offshoot in the form of *Claviclausa elegans*, d'Orb. (on slide). Middle Chalk. Chatham. Vine Coll., No. 107. Figd. Pl. XVII. Fig. 10.

D. 2712. Part of a branched zoarium of var. *crassicaulata*. Middle Chalk. Chatham. Vine Coll.

D. 361. Three fragments of a zoarium, showing internal structure (on slide). Middle Chalk. Chatham. Gamble Coll.

D. 2836. A zoarium of var. *crassicaulata*. Upper Chalk. Bromley. J. Simmons Coll.

D. 3260. A fragment of a zoarium (mounted with **D. 3258-9**). Upper Chalk Powder. Between Black Head and Gobbin.

D. 4118. A long, branched zoarium of var. *magnocaulata*, partly worn, and with one long, free peristome, as in **D. 4559.** Middle Chalk. Chatham. Gamble Coll.

D. 4563. A zoarium of var. *crassicaulata* with highly raised peristomes. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVII. Fig. 4.

D. 4943. A fragment on slide. Middle Chalk. Chatham. Gamble Coll.

D. 4137. A large, irregular base, attached to *Echinocorys scutatus*, Leske. Middle Chalk. Chatham. Gamble Coll.

D. 4197. A radially lobed base, with beginning of the erect branch. Middle Chalk. Chatham. Gamble Coll. Figd. Pl. XVII. Fig. 8.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. **clava** (d'Orbigny), 1851.

SYN. *Entalophora clava*, *pars*, d'Orbigny, 1851. Bry. Crét. pl. 620, figs. 3-6 (*non* 1, 2).
Claviclausa ,, d'Orbigny, 1853-4. *Ibid.* p. 890, pl. 765, fig. 5.
Heteropora ,, *pars*, Pergens, 1890. Revision, p. 370.

CHAR.—Zoarium clavate. Apertures in spiral rows on the lower part, and irregularly scattered above. Dactylethræ small.

DISTRIB.—Cenomanian: Le Mans, Sarthe; Villers, Calvados.

2. **harmeri** (Canu), 1898.

SYN. *Heteropora harmeri*, Canu. Bry. St. Cal.: Bull. Soc. géol. Fr. ser. 3, vol. xxv. p. 748, pl. xxii. figs. 7-10.

CHAR.—Zoarium irregular. Peristomes well raised. Dactylethræ in single bands. Elements large, as in *C. globulosa*.

DISTRIB.—Cenomanian: St. Calais, Sarthe.

3. **ramosa** (Pocta), 1892.

SYN. *Heteropora ramosa*, Pocta, 1892. Mech. Koryc. Hory: Ces. Ak. Fr. Jos. Praze, sect. ii. p. 24, pl. iii. figs. 1-6.

CHAR.—Zoarium of irregular, anastomosing branches. Dactylethræ few in number. Apertures crowded and irregular.

DISTRIB.—Cenomanian: Kank, Bohemia, in Korycaner Schichten.

4. **verrucosa** (Römer), 1840.

Syn. *Heteropora verrucosa*, Römer, 1840. Verst. nordd. Kr. p. 23, pl. v. fig. 26.

Char. — Zoarium of thick, dichotomous branches, with nodular surfaces. Dactylethræ large. Apertures separated by a single band of dactylethræ.

Distrib.—Senonian : Goslar, Germany.

REPTOMULTICLAUSA, d'Orbigny, 1854.

[Bry. Crét. p. 900.]

Synonyms.

? *Semimulticlausa*, d'Orbigny, 1854.
? *Semimulticrescis*, d'Orbigny, 1854.
Ditaxia, *pars*, Pergens, 1890.

Diagnosis.

Clausidæ with an adnate, multilamellar zoarium.

Type Species.

Reptomulticlausa orbignyi, nov. nom. Cenomanian : France.

UNREPRESENTED SPECIES.

1. **orbignyi,** nov. nom.

Syn. *non Ceriopora papularia*, Michelin, 1843-5. Icon. Zooph. pp. 124, 206, pl. xxxii. fig. 7.
non ,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 184.
Reptomulticlausa ,, d'Orbigny, 1853-4. Bry. Crét. p. 901, pl. 767, figs. 11-14.
Ditaxia (*Reptomulticlausa*) *papularia*, Pergens, 1890. Revision, p. 337.

Char.—Zoarium irregular, massive, or dendroid. Zoœcia subquincuncial in arrangement. Peristomes low. Dactylethræ in single series round the peristomes.

Distrib.—Cenomanian : Le Mans and Saint Jean-la-Forêt, Sarthe ; Honfleur and Villers, Calvados ; Coulange, Orne.

2. ? **variabilis,** d'Orbigny, 1853-4.

Syn. *Semimulticlausa variabilis*, d'Orbigny, 1853-4. Bry. Crét. p. 900, pl. 767, figs. 5-10.
Ditaxia (*Semimulticlausa*) *variabilis*, Pergens, 1890. Revision, p. 337.

Char.—Zoarium lamellar, tubular, or dendroid ; the lamellæ are numerous and thin. Peristomes low, distant. Dactylethræ (?) small and numerous.

Distrib.—Senonian—Coniacian : Villedieu and Lavardin, Loir-et-Cher ; near Tours, Indre-et-Loire.

Aff.—The study of microscopic sections of this species might necessitate its removal to the Cancellata.

3. ?**ramosa** (d'Orbigny), 1853–4.

Syn. *Semimulticrescis ramosa*, d'Orbigny, 1853–4. Bry. Crét. p. 1078, pl. 800, figs. 15–17.
Ditaxia ramosa, Pergens, 1890. Revision, p. 337.

Char.—Irregular, dendroid, hollow zoarium. Apertures large; dactylethræ few.

Distrib.—Cenomanian: Le Mans.

MULTICLAUSA, d'Orbigny, 1854.

[Bry. Crét. p. 899.]

Diagnosis.

Zoarium dendroid, composed of an axial bundle of zoœcia surrounded by several layers of zoœcia.

Type Species.

Multiclausa compressa, d'Orbigny. Senonian: France.

UNREPRESENTED SPECIES.

compressa, d'Orbigny, 1853.

Syn. *Multiclausa compressa*, d'Orbigny, 1853–4. Bry. Crét. p. 899, pl. 767, figs. 1–4.
,, ,, Pergens, 1890. Revision, p. 375.

Char.—Zoarium of stout, compressed, dichotomous branches. One or two external lamellæ round the stems. Apertures subquincuncial in distribution. Usually a complete circle of dactylethræ round each peristome.

Distrib.—Senonian—Santonian: Saintes, Charente.

Family TEREBELLARIIDÆ.

Diagnosis.

Cyclostomata Dactylethrata in which the dactylethræ occur in crowded bands, separating zones of apertures.

ZONOPORA, d'Orbigny, 1849.

[Gen. nouv. Bry.: Rev. Mag. Zool. ser. 2, vol. i. p. 503.]

Synonyms.

Ceriopora, pars, Goldfuss, 1827.
Terebellaria (*non* Lamx.), von Hagenow, 1851.
Spiroclausa, d'Orbigny, 1853.

DIAGNOSIS.

Terebellariidæ with a screw-shaped stem, with the zoœcia opening on a spiral ridge separated by a broad spiral band of dactylethræ.

The zoœcia grow from the axis of the branches, and are not developed in laminæ.

TYPE SPECIES.

Ceriopora spiralis, Goldfuss, 1827. Petref. Germ. vol. i. p. 36, pl. xi. fig. 2. Maastrichter Kreide: Maastricht.

AFFINITIES.

For this genus the name of *Spiroclausa* has generally been adopted, which is unfortunate, since *Zonopora* has four years' priority. *Zonopora* was founded on this species, which is therefore necessarily the type.

Zonopora is allied to *Terebellaria* by the screw-shaped zoarium and spiral band of dactylethræ; but it has not the laminar, acropetal growth of the Jurassic genus.

1. **Zonopora spiralis** (Goldfuss), 1827.

SYNONYMY.

Milléporite en colonne torse, Faujas St. Fond, 1799. Mont St. Pierre, p. 192, pl. xxxv. figs. 9, 10.
Ceriopora spiralis, Goldfuss, 1827. Petref. Germ. vol. i. p. 36, pl. xi. fig. 2.
,, ,, Morren, 1829. Cor. Belg.: Ann. Accad. Groning. 1828, p. 41.
,, ,, von Hagenow, 1846. In Geinitz, Grundr. Verst. vol. ii. p. 599.
Zonopora ,, d'Orbigny, 1849. Gen. nouv. Bry.: Rev. Mag. Zool. ser. 2, vol. i. p. 503.
,, ,, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.
Terebellaria ,, *pars*, von Hagenow, 1851. Bry. Maastr. Kr. p. 22, pl. iii. figs. 9*a*, *b*, *e*, *f*; *non c*, *d*, *g*-*l*.
Spiroclausa ,, d'Orbigny, 1853-4. Bry. Crét. p. 883, pl. 764, figs. 1–5.
,, ,, *pars*, Winkler, 1864. Mus. Teyl.: Cat. Pal. livr. ii. p. 212.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 29.
,, ,, Ubaghs, 1888. Compl. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 233.
,, ,, Pergens, 1890. Revision, p. 354.
Zonopora elegans, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 267.

Diagnosis.

Zoarium branched; the ridges of the screw are well rounded.

Apertures irregularly arranged and crowded; about four series in each band. The apertures do not occur in definite vertical series, separated by grooves.

Distribution.

Senonian—Maastrichter Kreide: Maastricht; Falkenberg.

LIST OF SPECIMENS.

D. 3034. Three branches (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3035. Thirty fragments, two showing the base and the thick, irregular basal branch. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3028. A branch (on slide). Maastrichter Kreide. Maastricht. Old Coll.

D. 3309. Three branches (on slide). Maastrichter Kreide. Maastricht. Old Coll.

D. 3751. A branched fragment (on slide). Maastrichter Kreide. Maastricht. Gamble Coll.

D. 3332. A branch (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3310. Twelve branches. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 3335. Two malformed branches (on slide). Maastrichter Kreide. Maastricht. Van Breda Coll.

60,158. Seventy-eight branches. Maastrichter Kreide. Maastricht. Van Breda Coll.

D. 6396. Five fragments (on slide). Maastrichter Kreide. Falkenberg. Busk Coll.

D. 1384-5. Three fragments (on two slides). Maastrichter Kreide. Maastricht. Vine Coll.

UNREPRESENTED AND DOUBTFUL SPECIES.

1. ? **biformis** (Römer), 1839.

Syn. *Pustulopora biformis*, Römer, 1839. Verst. nordd. Ool.: Nachtr. p. 12, pl. xvii. fig. 20.

,, ,, Römer, 1840. Verst. nordd. Kr. p. 22.

? *Spiroclausa neocomiensis*, de Loriol, 1863. Invert. Mt. Sal. p. 137, pl. xvii. fig. 7.

Char.—Stems constricted. Apertures biserial or triserial bands. Dactylethræ (?) small, occupying the constricted portions of the stems.

Distrib. — Neocomian — Hilsconglomerat: Schöppenstedt, Hannover; La Varappe, Mont Salève, Switzerland.

2. **canalifera** (Ubaghs), 1865.

Syn. *Spiroclausa canalifera*, Ubaghs, 1865. Bry. Sch. Maastr.: Verh. nat. hist. Ver. preuss. Rheinl. vol. xxii. p. 60, pl. iii. fig. 10.
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 402.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 30.

Char.—Zoarium with sharp-edged screw edges, and apertures in vertical series separated by straight furrows.

Distrib.—Senonian—Maastrichtian: Maastricht.

3. **indica**, Stoliczka, 1872.

Syn. *Zonopora indica*, Stoliczka, 1872. Pal. Ind. Cret.: Fauna S. Ind. vol. iv. pt. 2, p. 28, pl. iii. fig. 5.

Char.—Irregular branches, with broad belts of dactylethræ; and possibly some dactylethræ scattered among the apertures.

Distrib.—Turonian—Arrialoor Group: north of Poodoopolliam, South India.

4. **paucipora** (Hamm), 1881.

Syn. *Spirofascigera paucipora*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 30.

Char.—Apertures in groups on the spiral ridges.

Distrib.—Senonian—Maastrichtian: Vetschau, Limburg.

Family RETICULIPORIDÆ.

[Cat. Jur. Bry. p. 192.]

Diagnosis.

Cyclostomata Dactylethrata with a branching zoarium of compressed branches, composed of a zoarial lamina and crowded series of zoœcia and dactylethræ. The apertures are confined to the obverse part of the branches.

RETICULIPORA, d'Orbigny, 1849.

[Gen. nouv. Bry.: Rev. Mag. Zool. ser. 2, vol. i. p. 501.]

Synonyms.

Holostoma, Lonsdale, 1850; *non* Nitsche, 1816.
Apsendesia, *pars*, de Blainville.
Retelea, d'Orbigny, 1853.

Diagnosis.

Reticuliporidæ with a reticulate or radial zoarium. Apertures on the obverse edges of the branches or in short transverse series.

TYPE SPECIES.

Reticulipora dianthus (de Blainville), 1834. Bathonian : France.

Reticulipora contingens (Lonsdale), 1850.

SYNONYMY.

Holostoma contingens, Lonsdale, 1850. Geol. Suss. p. 294, pl. xviii. A, figs. 9, 9*a*–9*g*.

DIAGNOSIS.

Zoarium flat and large; the branches are thin in front, but thick and well-rounded behind. The front appears somewhat carinate owing to the development of an irregular zoarial lamina.

Peristomes low; the number of apertures in a vertical series is small, usually three or four. The sides of the branches are crossed by faint vertical ribs, which, however, are irregular, and often obscurely developed.

DISTRIBUTION.

Upper Chalk : Sussex ; Bromley.

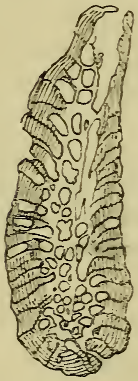

FIG. 62.

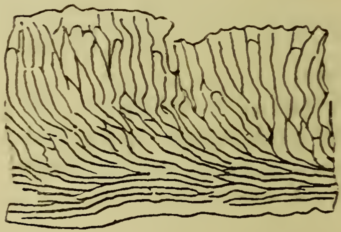

FIG. 63.

Reticulipora contingens (Lonsd.). Transverse and longitudinal sections.

FIGURES.

No. 62. A transverse section across a branch, × 15 dia. Upper Chalk : Bromley. Bowerbank Coll. **D. 3101.**

No. 63. A longitudinal section along a branch of the same, × 12 dia. Upper Chalk : Bromley. Bowerbank Coll. **D. 3101.**

LIST OF SPECIMENS.

D. 2952.	The type-specimen of the species. Upper Chalk. Sussex. Figd. Dixon, Geol. Suss. pl. xviii. A, figs. 9, 9*d*.
D. 3090.	Part of an old zoarium, the front of which is much worn. Figd. Dixon, *ibid.* fig. 9*a*.
B. 4494.	Fragment mounted to show side view. Figd. Dixon, *ibid.* fig. 9*c*.
D. 2947.	A medium-sized zoarium showing both surfaces. Upper Chalk. Figd. Dixon, *ibid.* fig. 9*b*.
B. 4495.	Fragment rubbed down to show vertical longitudinal section. Figd. Dixon, *ibid.* fig. 9*e*.
B. 4496.	Fragment rubbed down to show vertical longitudinal section nearer the central line. Figd. Dixon, *ibid.* fig. 9*f*.
B. 4497.	Specimen showing transverse section. Figd. Dixon, *ibid.* fig. 9*g*.
60,122.	A large flabellate zoarium, 95 mm. by 55 mm. Upper Chalk. Bromley. J. Simmons Coll., 1867.
D. 3100.	Part of a large zoarium and an isolated fragment. Upper Chalk. Bromley. Bowerbank Coll.
D. 3101.	Part of a zoarium, two fragments on slide, and two transparent sections. Upper Chalk. Bromley. Bowerbank Coll. Figd. Nos. 62 and 63, p. 430.
D. 3073.	A zoarium. Upper Chalk. Bromley. Toulmin Smith Coll.
D. 2297.	A zoarium. Upper Chalk. Kent. P. B. Brodie Coll.
D. 2951.	Two small zoaria. Upper Chalk. Loc. ? Dixon Coll.
D. 3102.	Two zoaria. Upper Chalk. Bromley. Bowerbank Coll.
D. 3103.	A flabellate zoarium, 55 mm. high. Upper Chalk. Loc. ? Bowerbank Coll.
60,189.	A large zoarium. Upper Chalk. Bromley. J. Simmons Coll.

UNREPRESENTED SPECIES.

1. ? **ovalis** (Gabb & Horn), 1862.

SYN. *Retelea ovalis*, Gabb & Horn, 1862. Foss. Polyz. N. Amer.: Journ. Acad. Nat. Sci. Phil. ser. 2, vol. v. p. 164, pl. xxi. fig. 52.

DISTRIB.—Turonian: Mullica Hill, New Jersey.

CHAR.—Affinities doubtful, owing to large size of the apertures.

2. **procera** (Hamm), 1881.

SYN. *Spiroclausa procera*, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 29.
non ,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 33, pl. iii. fig. 5.
Terebellaria spiralis, von Hagenow, 1851. Bry. Maastr. Kr. pl. iii. fig. 9*g* (*non a-c*, *e*, *f*, *l*).

CHAR. — Zoarium laterally compressed, branches with lateral 'kegelförmiges Zapfen.' Apertures confined to the obverse edge.

DISTRIB.—Senonian—Maastrichtian: Fauquemont; Kunraed.

AFF.—The *S. procera* of Marsson agrees with the figs. *e*, *f*, *l* of von Hagenow, and not with the laterally compressed form which Hamm took as his type.

3. pulchella (d'Orbigny), 1853.

Syn. *Retelea pulchella*, d'Orbigny, 1853. Bry. Crét. p. 635, pl. 762, figs. 1–6.

Char.—Branches mæandriform. Zoœcia externally rhomboidal, about four rows on each side of the obverse edge.

Distrib.—Senonian: Trôot, Loir-et-Cher.

ADDENDA.

p. 3, after line 4 add:

Stomatopora granulata, de Loriol, 1868. Val. Arz.: Pal. Suisse, ser. 4, pt. 2, p. 60, pl. v. fig. 12.

p. 3, after line 10 add:

Stomatopora granulata, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. pp. 507, 510.

p. 4, before last line but one add:

Stomatopora incrassata, de Loriol, 1863. Invert. Mt. Sal. p. 131, pl. xvi. fig. 8.

p. 21:

UNREPRESENTED SPECIES.

filiformis.

Syn. *Stomatopora filiformis*, de Loriol, 1863. Invert. Mt. Sal. p. 132, pl. xvi. figs. 6, 7.

Char.—Zoœcia long, fusiform. Peristomes slightly raised. Allied to *S. dichotomoides* (Orb.).

Distrib.—Hauterivian: Mont Salève, near Geneva.

p. 49, to Distribution add:

Danian: Faxoe.
Campanian: Rügen.

p. 64, add:

11*. marginata (d'Orbigny), 1853; *non* d'Orbigny, 1853.

SYN. *Reptotubigera marginata*, d'Orbigny, 1853. Bry. Crét. p. 753, pl. 750, figs. 19–21.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 31.
,, ,, Pergens, 1890. Revision, p. 340.

CHAR.—Zoarium of broad branches with regular, transverse lines of apertures, similar to those of *P. radiolitorum*, but more distant and regular.

DISTRIB.—Senonian: France; Rügen.

p. 65, after line 2 add:

Tubulipora parca, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 630, pl. xxiii. *b*, fig. 57.

p. 66, after No. **18** add:

19. jaccardi, de Loriol, 1868.

SYN. *Proboscina jaccardi*, de Loriol, 1868. Val. Arz.; Pal. Suisse, ser. 4, pt. 2, p. 60, pl. v. figs. 13, 14.

CHAR.—Zoarium of irregular branches. Apertures crowded, subquincuncial. Peristomes slightly raised.

DISTRIB.—Neocomian: Arzier, Switzerland.

20. neocomiensis (d'Orbigny), 1853.

SYN. *Reptotubigera neocomiensis*, d'Orbigny, 1853. Bry. Crét. p. 752, pl. 763, figs. 1–3.
,, ,, Pergens, 1890. Revision, p. 340.

CHAR.—Branches narrow, long, dichotomous, with apertures in single transverse rows, about five in a row.

DISTRIB.—Neocomian: Sainte-Croix, Switzerland.

p. 68, to Distribution add:

Cenomanian: St. Calais, Sarthe.

p. 70, add:

8. fragilis (Marsson), 1887.

SYN. *Filisparsa fragilis*, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 35, pl. iii. fig. 8.

CHAR.—Branches almost cylindrical; apertures large, in transverse, slightly oblique rows of from five to six. Reverse face narrow, ridged, with occasional large apertures.

DISTRIB.—Senonian—Campanian: Rügen.

p. 70, after the genus **Filisparsa** add:

FILICRISINA, d'Orbigny, 1853.

[Bry. Crét. p. 910.]

DIAGNOSIS.

Diastoporidæ with the zoarium composed of cylindrical or compressed branches, which are dichotomous, and may anastomose into a reticular zoarium. The obverse face is bare, and its walls are imperforate.

Apertures placed in complete, continuous rows across the obverse face. The reverse face bears only small pores of the epitheeal tubuli.

TYPE SPECIES.

Filicrisina retiformis, d'Orbigny, 1853–4. Senonian: France. This genus differs from *Filisparsa* by having the reverse face strengthened by a series of rudimentary zoœcia which open by small pores. This layer may be strengthened further by an epithecal lamina.

Filicrisina verticillata, d'Orbigny, 1853–4.

SYNONYMY.

Filicrisina verticillata, d'Orbigny, 1853–4. Bry. Crét. p. 911, pl. 769, figs. 5–10.[1]
,, ,, Staring, 1860. Bod. Nederl. vol. ii. p. 402.
,, ,, Marsson, 1887. Bry. Rüg.: Pal. Abh. vol. iv. p. 33.
,, ,, Ubaghs, 1888. Bull. Soc. belge Géol. vol. i., Mém. p. 233.
,, ,, Pergens, 1890. Revision, p. 352.

DIAGNOSIS.

Zoarium open and dichotomous; the branches are cylindrical. The apertures are large and occur in transverse rows of from four to six. The reverse face is marked by lozenge-shaped areas and by small ridges; the tubuli are scattered irregularly.

DIMENSIONS.

	B.M., D. 3269.
Diameter of branch	1 mm.
Diameter of zoœcia	·16–·25 ,,
Diameter of aperture	·12–·16 ,,

---

[1] Marsson excluded fig. 8 as a *Melicertites*, interpreting the pores of the tubuli as zoœcial apertures.

DISTRIBUTION.

BRITISH :

Upper Chalk : Ballytoben, Magee Island, North-East Ireland.

FOREIGN :

Senonian—Maastrichtian : Meudon ; Sainte-Colombe, Manche ; Pons, Charente-Inférieure ; Ciply.

Campanian : Rügen.

FIGURES.

Figs. 64*a*, *b*. Obverse and reverse sides of a fragment, × 12 dia., from the Chalk Powder of Ballytoben, Magee Island, North-East Ireland. Presented by J. Wright, Esq. In Fig. 64*b*, the epitheeal layer is broken away at the upper end of the branch.

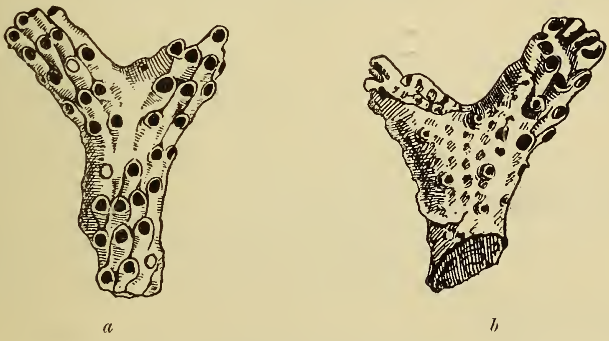

FIG. 64.—*Filicrisina verticillata*, Orb. *a*, obverse ; *b*, reverse.

LIST OF SPECIMENS.

D. 3269. A branched fragment. Upper Chalk Powder. Ballytoben, Magee Island, North-East Ireland. Presented by J. Wright, Esq. Figd. Nos. 64*a*, *b*.

D. 3268. Two small fragments of the same from the same locality. Presented by J. Wright, Esq.

UNREPRESENTED SPECIES.

1. **retiformis,** d'Orbigny, 1853.

SYN. *Filicrisina retiformis*, d'Orbigny, 1853–4. Bry. Crét. p. 911, pl. 769, figs. 1–4.

,, ,, Pergens, 1890. Revision, p. 352.

Char.—Branches subtriangular. Transverse series of apertures crowded. On the reverse face there are a few very distinct, irregularly scattered apertures of large size, which are but slightly smaller than the apertures of the normal zoœcia of the obverse side.

Distrib.—Senonian: Vendôme, Loir-et-Cher; Saint-Germain, Sarthe; Tours, Indre-et-Loire.

p. 73, after line 16 add:

Berenicea flabelliformis, de Loriol, 1863. Invert. Mt. Sal. p. 134, pl. xvii. figs. 1, 2.

p. 77, after line 8 add:

? *Cellepora fistularis*, von Hagenow, 1846. In Geinitz, Grundr. Verst. p. 612, pl. xxiii. *b*, fig. 33.

p. 100, after line 9 add:

Berenicea polystoma, de Loriol, 1863. Invert. Mt. Sal. p. 133, pl. xvii. fig. 3.

p. 116, after No. **10** add:

11. pulchella, de Loriol, 1863.

Syn. *Berenicea pulchella*, de Loriol, 1863. Invert. Mt. Sal. p. 135, pl. xvi. fig. 9.

Char.—Zoarium irregular; zoœcia short and fusiform. Peristomes thick and irregularly arranged.

Distrib.—Neocomian: Mont Salève, near Geneva.

p. 126, after No. **5** add:

6. tenella, de Loriol, 1868.

Syn. *Reptomultisparsa tenella*, de Loriol, 1868. Val. Arz.: Pal. Suisse, ser. 4, pt. 2, p. 61, pl. v. figs. 15, 16.

Char.—Allied to *R. confluens* (Rss. & Nov.), but with a broader peripheral zone of crowded apertures.

Distrib.—Valangian: Arzier, Switzerland.

p. 134, Distribution, add to Coniacian localities: St. Paterne.

p. 135, after line 13 add:

D. 4004. A lobed zoarium. Coniacian. St. Paterne, Indre-et-Loire. Gamble Coll.

p. 139, add after No. **18**:

?**19. latomarginata,** d'Orbigny, 1854.

Syn. *Diastopora latomarginata,* d'Orbigny, 1854. Bry. Crét. p. 827.
,, ,, Ubaghs, 1879. Géol. Pal. Limb. p. 223.
,, ,, Hamm, 1881. Bry. mastr. Ob.-Sen. p. 25.

Char.—This species is recorded as Cretaceous by Ubaghs and Hamm; it was founded for a recent specimen with very long zoœcia from Newfoundland.

20. neocomiensis, de Loriol, 1863; *non* (d'Orbigny), 1853–4.

Syn. *Diastopora neocomiensis,* de Loriol, 1863. Invert. Mt. Sal. p. 130, pl. xvi. fig. 8.

Char.—Broad tubular zoarium with low, irregularly scattered peristomes.

Distrib.—Neocomian: Mont Salève, near Geneva.

p. 155, after No. **3** add:

4. simplex (de Loriol), 1863.

Syn. *Reptotubigera simplex,* de Loriol, 1863. Invert. Mt. Sal. p. 127, pl. xvi. fig. 3.

Char.—Zoarium simple, triangular in section, expanding gradually to the distal end. Apertures in rows of from three to four. Peristomes low.

Distrib.—Neocomian: Mont Salève, near Geneva.

5. virgula, d'Orbigny, 1851.

Syn. *Idmonea virgula,* d'Orbigny, 1851. Bry. Crét. pl. 631, figs. 15–17.
Reptotubigera ,, d'Orbigny, 1853. *Ibid.* p. 753.
,, ,, Pergens, 1890. Revision, p. 357.

Char.—Zoarium simple; no selvage; clavate in shape. Apertures in subalternate rows of from three to four.

Distrib.—Cenomanian: Le Mans, France.

p. 166, after last line add:

Reptotubigera angulosa, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.

p. 183, to Synonymy add:

Idmonea distans, Bucaille, 1890. *Ibid.* p. 510.

After p. 186, add:

BICRISINA, d'Orbigny, 1853–4.

[Bry. Crét. p. 909.]

DIAGNOSIS.

Crisinæ with laterally compressed branches; the zoarium is not reticulate. The apertures are in vertical series, alternately long and short. The interzoœcial sutures are widened into pore-like cavities. There is no reverse axis.

TYPE SPECIES.

Reticulipora cultrata, d'Orbigny, 1850. Senonian: France.

AFFINITIES.

The genus is allied to *Reticrisina*, but it differs mainly by having the broadened, pore-like sutures of *Sulcocava*.

1. cultrata (d'Orbigny), 1850.

SYN. *Reticulipora cultrata*, d'Orbigny, 1850. Prod. Pal. vol. ii. p. 265.
,, ,, d'Orbigny, 1851. Bry. Crét. pl. 611, figs. 6–10.
Bicrisina ,, d'Orbigny, 1853–4. *Ibid.* p. 909, pl. 768, figs. 11–15.
,, ,, Pergens, 1890. Revision, p. 356.
Idmonea ,, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.

DISTRIB.—Senonian: Charente-Inférieure.

2. gaudryi, Pergens, 1890.

SYN. *Bicrisina gaudryi*, Pergens, 1890. Revision, p. 356, pl. xiii. fig. 2.
CHAR.—Branches very flattened. Peristomes low. Massive reverse axis.
DISTRIB.—Senonian: France.

p. 192, to Synonymy add:

Idmonea divaricata, Ubaghs, 1888. Compt. Rend. Exc.: Bull. Soc. belge Géol. vol. i., Mém. p. 221.

p. 200, after line 3 add:

Reptotubigera filiformis, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.

p. 207, to Synonymy of species 10 add:

Idmonea subgradata, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 510.

p. 212, to Synonymy add:

Ceriopora cristata, *Ceriopora lacryma*, and *Ceriopora sulcata*, Bucaille, 1890. Bry. Crét. Seine-Inf.: Bull. Soc. Sci. nat. Rouen, vol. xxv. p. 512.

p. 216, after line 6 add:

3. macgillivrayi, Pergens, 1894.

Syn. *Ceidmonea macgillivrayi*, Pergens, 1894. Bry. Limb.: Bull. Soc. belge Géol. vol. vii. p. 179, pl. ix. figs. 3*a*, *b*.

Char.—This genus is founded on a worn fragment, of which the surface of the obverse face has been destroyed.

p. 231, after line 20 add:

Entalophora angusta, d'Orbigny, 1853. *Ibid.* p. 783.
? ,, ,, Keeping, 1883. Neoc. Upware, p. 137.

p. 315, to Unrepresented Species add:

3. punctulata (d'Orbigny), 1853.

Syn. *Myriozoum punctatum*, d'Orbigny, 1853. Bry. Crét. p. 663, pl. 783, figs. 4–7.
,, ,, Pergens, 1890. Revision, p. 400.
,, *punctulatum*, d'Orbigny, 1854. Bry. Crét. p. 663.
Melicertites punctatum, Pergens, 1893. Bry. St. Pat.: Bull. Soc. belge Géol. vol. vi., Pr. Vb. p. 212.
,, ,, Pergens, 1895. Bry. Cachemb.: *ibid.* vol. viii., Pr. Vb. p. 182.

Char.—Zoarium of slender branches; apertures quincuncial, with a straight lower lip. Surface punctate.

Distrib.—Senonian—Santonian: Cachembach, Eure-et-Loir.
Coniacian: Vendôme, Loir-et-Cher; Sainte-Paterne, Indre-et-Loire.

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28 DEC. 1899
BRITISH MUSEUM NATURAL HISTORY

STEPHEN AUSTIN AND SONS, PRINTERS, HERTFORD.

EXPLANATION OF PLATES.

PLATE I.

FIG. 1. *Stomatopora granulata* (Edw.), var. *gigantea*, Perg. Upper Chalk: England. An unusually corrugated zoarium approaching *S. rugulosa*. Part of a zoarium, × 5 dia. Old Coll. [B. 4245.]

FIG. 2. *Stomatopora granulata* (Edw.). Chalk: near Tong, Sittingbourne. Two branches of a thinner zoarium, × 6 dia. T. R. Jones Coll. [B. 112.]

FIG. 3. *Stomatopora granulata* (Edw.), var. *rugulosa* (Rss.). Chalk: Stoke Pit, Guildford. Two parts of a zoarium, × 7 dia. H. Capron Coll. [D. 5147.]

FIG. 4. *Stomatopora granulata* (Edw.), var. *rugulosa* (Rss.). Upper Chalk: Bromley. An irregular zoarium, × 10 dia. J. Simmons Coll. [D. 2843.]

FIG. 5. *Stomatopora divaricata* (Röm.). Chalk: Sussex. Part of a zoarium, × 7 dia. Dixon Coll. [60,252.]

FIG. 6. *Stomatopora granulata* (Edw.). Middle Chalk: Chatham. Part of a zoarium with the zoœcia tending towards a subpiriform shape; × 10 dia. Gamble Coll. [D. 3788.]

FIG. 7. *Stomatopora granulata* (Edw.). Middle Chalk: Chatham. A zoarium in places passing to *calypso* (Orb.); × 10 dia. Gamble Coll. [D. 369.]

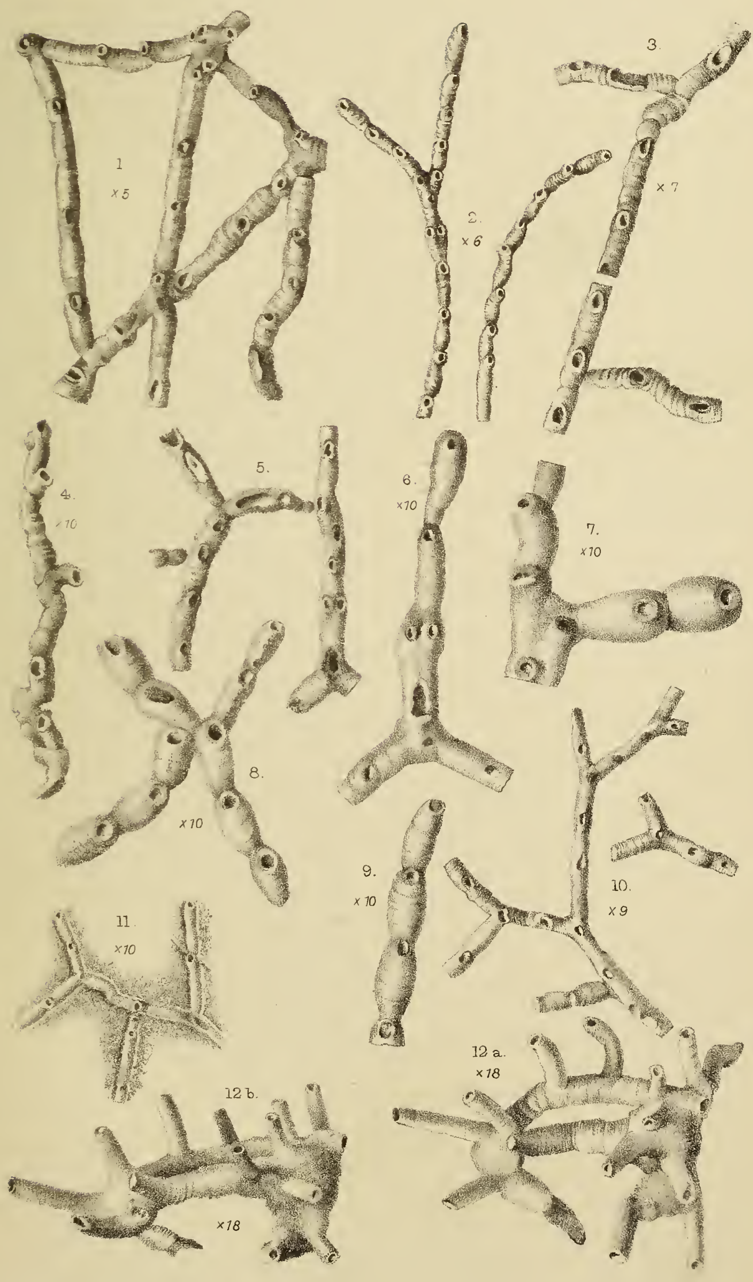
FIG. 8. *Stomatopora calypso* (Orb.). Middle Chalk: Chatham. Part of a zoarium, × 10 dia. Vine Coll. [D. 953.]

FIG. 9. *Stomatopora calypso* (Orb.). Red Chalk: Hunstanton. Three zoœcia, × 10 dia. Jesson Coll. [D. 2015.]

FIG. 10. *Stomatopora gracilis* (Edw.). Upper Chalk: Gravesend. Two parts of a zoarium, × 9 dia. Wetherell Coll. [57,553.]

FIG. 11. *Stomatopora gracilis* (Edw.). Middle Chalk: Chatham. Part of a zoarium imbedded in an echinid plate, × 10 dia. Vine Coll. [D. 954.]

FIG. 12 *Stomatopora spicea*, n.sp. Middle Chalk: Chatham. Fig. 12*a* side view, and Fig. 12*b* upper view, of a zoarium; × 18 dia. Gamble Coll. [D. 3831.



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Stomatopora.

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NATURAL HISTORY

PLATE II.

FIG. 1. *Proboscina angustata* (Orb.). Upper Chalk: England. A zoarium encrusting an echinid fragment, × 7 dia. Morris Coll. [50,470.]

FIG. 2. *Proboscina ramosa* (Edw.). Upper Chalk: Kent. Part of a zoarium encrusting *Galerites albogalerus*, × 11 dia. Bowerbank Coll. [D. 2975.]

FIG. 3. *Proboscina crassa* (Röm.), var. *alectodes*. Middle Chalk: Chatham. A zoarium with well-raised peristomes and uniserial offshoots, × 12 dia. Vine Coll. [D. 2683.]

FIG. 4. *Proboscina crassa* (Röm.), var. *alectodes*. Middle Chalk: Chatham. Part of an irregular zoarium with many uniserial branches, × 6 dia. Gamble Coll. [D. 3798.]

FIG. 5. *Proboscina crassa* (Röm.), var. *alectodes*. Middle Chalk: Chatham. Part of a zoarium which in one branch approximates to *P. fasciculata*, × 12 dia. Gamble Coll. [D. 3817.]

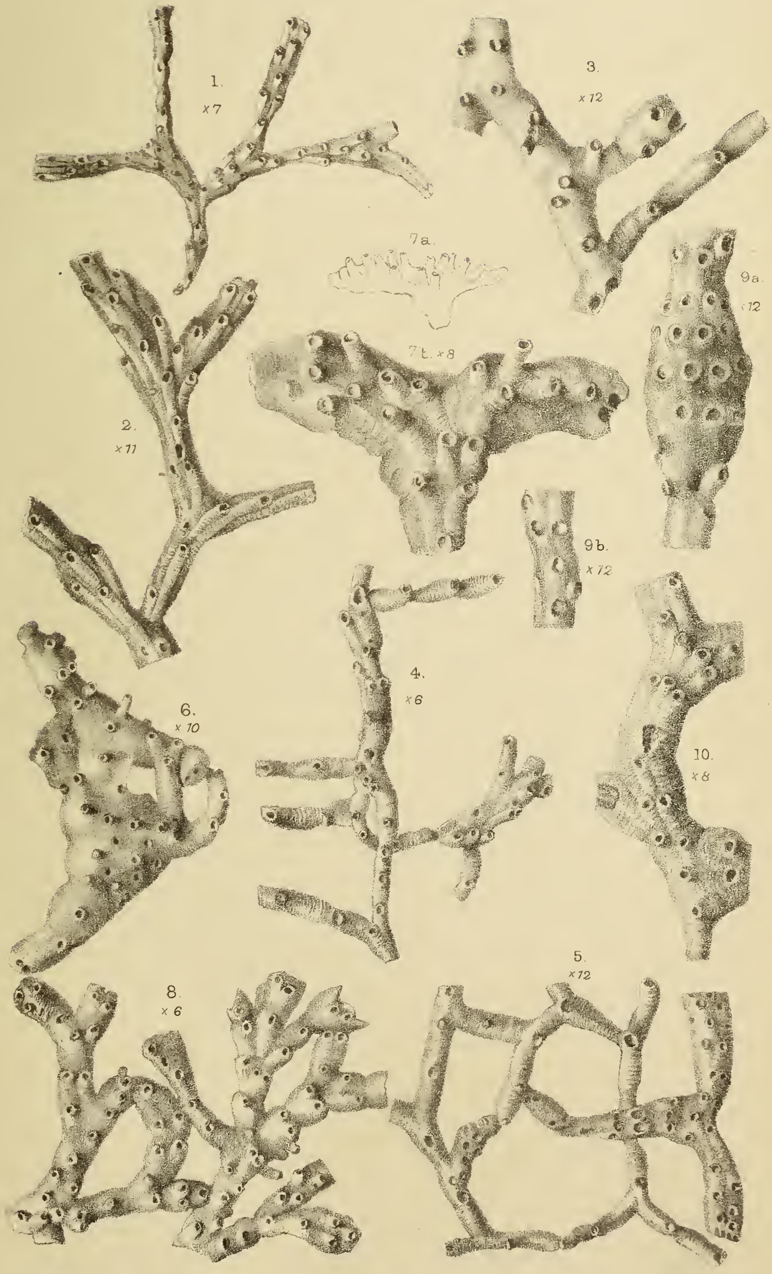
FIG. 6. *Proboscina crassa* (Röm.), var. *elevata*. Middle Chalk: Chatham. Part of a zoarium, × 10 dia. Vine Coll. [D. 997.]

FIG. 7. *Proboscina parasitica* (Hag.). Middle Chalk: Chatham. Fig. 7*a*, side view, × 4 dia.; Fig. 7*b*, the same specimen from above, × 8 dia. Vine Coll. [D. 998.]

FIG. 8. *Proboscina crassa* (Röm.), var. *divaricata*. Lower Greensand: Farringdon. Part of a worn zoarium, × 6 dia. Cunnington Coll. [60,538.]

FIG. 9. *Proboscina anomala*, Rss. Upper Chalk: Kent. Fig. 9*a*, part of zoarium including an expansion (? gonœcial), × 12 dia.; Fig. 9*b*, part of lower part of the same, × 12 dia. Bowerbank Coll. [D. 2976.]

FIG. 10. *Proboscina crassa* (Röm.), var. *francorum* (Perg.). Middle Chalk: Chatham. Part of loose portion of a zoarium, × 8 dia. Gamble Coll. [D. 3844.]



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Proboscina.

BRITISH MUSEUM
NATURAL HISTORY.

PLATE III.

Fig. 1. *Proboscina bohemica*, Novak, var. *chathamensis.* Middle Chalk: Chatham. Fig. 1*a*, zoarium, nat. size; Fig. 1*b*, part of a zoarium, × 10 dia. Presented by W. Gamble, Esq. [D. 2978.]

Fig. 2. *Proboscina fasciculata* (Rss.), var. *toucasi* (Orb.). Middle Chalk: Chatham. Fig. 2*a*, part of a zoarium, nat. size; Fig. 2*b*, part of the same, × 14 dia. Gamble Coll. [D. 466.]

Fig. 3. *Proboscina fasciculata* (Rss.), var. *toucasi* (Orb.). Middle Chalk: Chatham. Part of a zoarium, × 16 dia. Vine Coll. [D. 2669.]

Fig. 4. *Proboscina fasciculata* (Rss.), var. *toucasi* (Orb.). Middle Chalk: Chatham. Part of a zoarium, × 8 dia. Gamble Coll. [D. 3813.]

Fig. 5. *Proboscina radiolitorum* (Orb.). Upper Chalk: Gravesend. Fig. 5*a*, zoarium, nat. size; Fig. 5*b*, part of zoarium, × 15 dia. Presented by F. Harford, Esq. [D. 2300.]

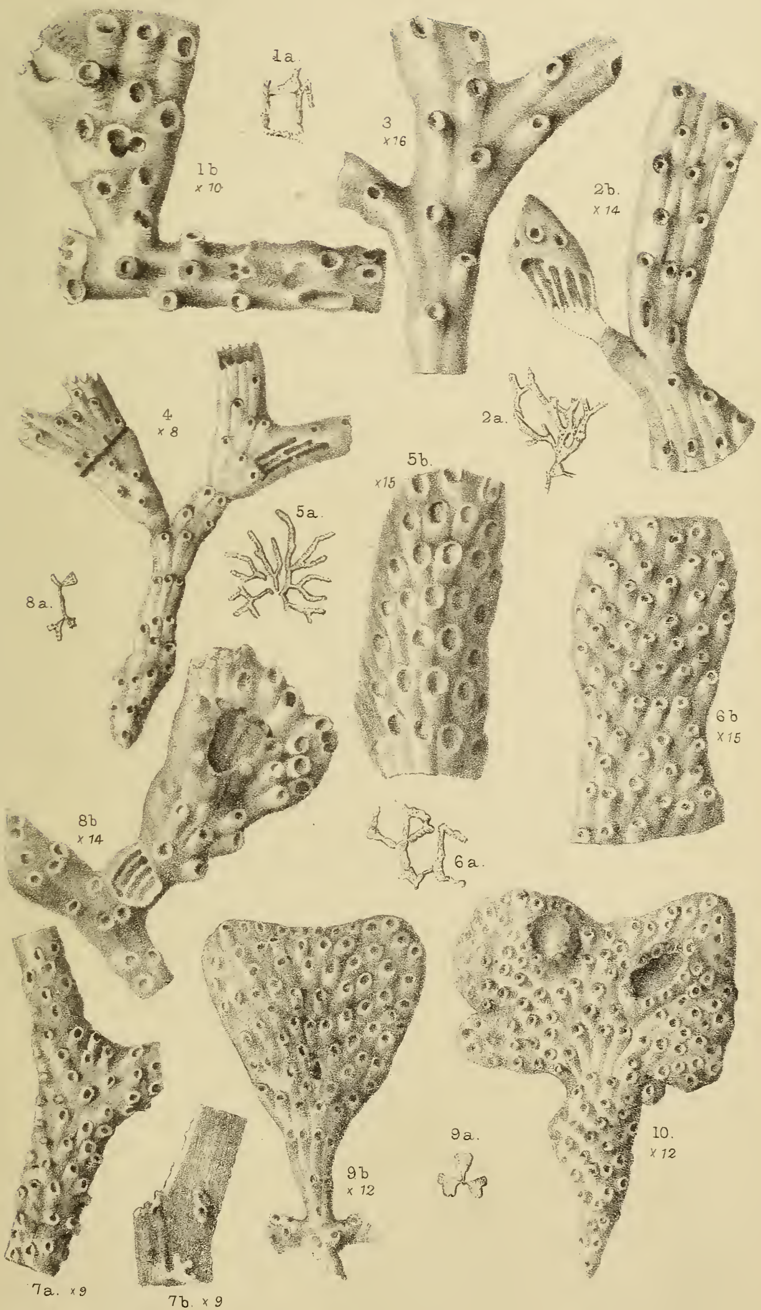
Fig. 6. *Proboscina cornucopiæ* (Orb.). Middle Chalk: Chatham. Fig. 6*a*, zoarium, nat. size; Fig. 6*b*, part of a zoarium, × 15 dia. Gamble Coll. [D. 485.]

Fig. 7. *Filisparsa reticulata*, Orb. Middle Chalk: Chatham. Fig. 7*a*, the obverse face, × 9 dia.; Fig. 7*b*, part of the reverse face, × 9 dia. Gamble Coll. [D. 4192.]

Fig. 8. *Proboscina sarthacensis* (Perg.). Middle Chalk: Chatham. Fig. 8*a*, zoarium, nat. size; Fig. 8*b*, part of a zoarium, × 14 dia. Gamble Coll. [D. 441.]

Fig. 9. *Proboscina cornucopiæ* (Orb.). Middle Chalk: Chatham. Fig. 9*a*, zoarium, nat. size; Fig. 9*b*, part of a zoarium, × 12 dia. Gamble Coll. [D. 440.]

Fig. 10. *Proboscina cornucopiæ* (Orb.). Middle Chalk: Chatham. A zoarium with two broken gonocysts, × 12 dia. Vine Coll. [D. 2686.]



E. Drake ad nat. lith.

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Proboscina.

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NATURAL HISTORY

PLATE IV.

Fig. 1. *Proboscina cornucopiæ* (Orb.). Middle Chalk: Chatham. Fig. 1*a*, zoarium, × 6 dia.; Fig. 1*b*, part of the same, with gonocyst, × 18 dia. Vine Coll. [D. 986.]

Fig. 2. *Proboscina bohemica*, Novak. Upper Chalk—*Actinocamax quadratus* zone: East Harnham, Wilts. Fig. 2*a*, zoarium, nat. size; Fig. 2*b*, part of a zoarium, × 14 dia. Gamble Coll. [D. 4316.]

Fig. 3. *Proboscina elevata* (Orb.). Middle Chalk: Chatham. Expanded end of a zoarium, × 12 dia. Gamble Coll. [D. 4148.]

Fig. 4. *Proboscina hunstantonensis*, Vine. Upper Greensand: Cambridge. Vine's type-specimen. Fig. 4*a*, zoarium, nat. size; Fig. 4*b*, part of the same, × 10 dia. Jesson Coll. [D. 2937.]

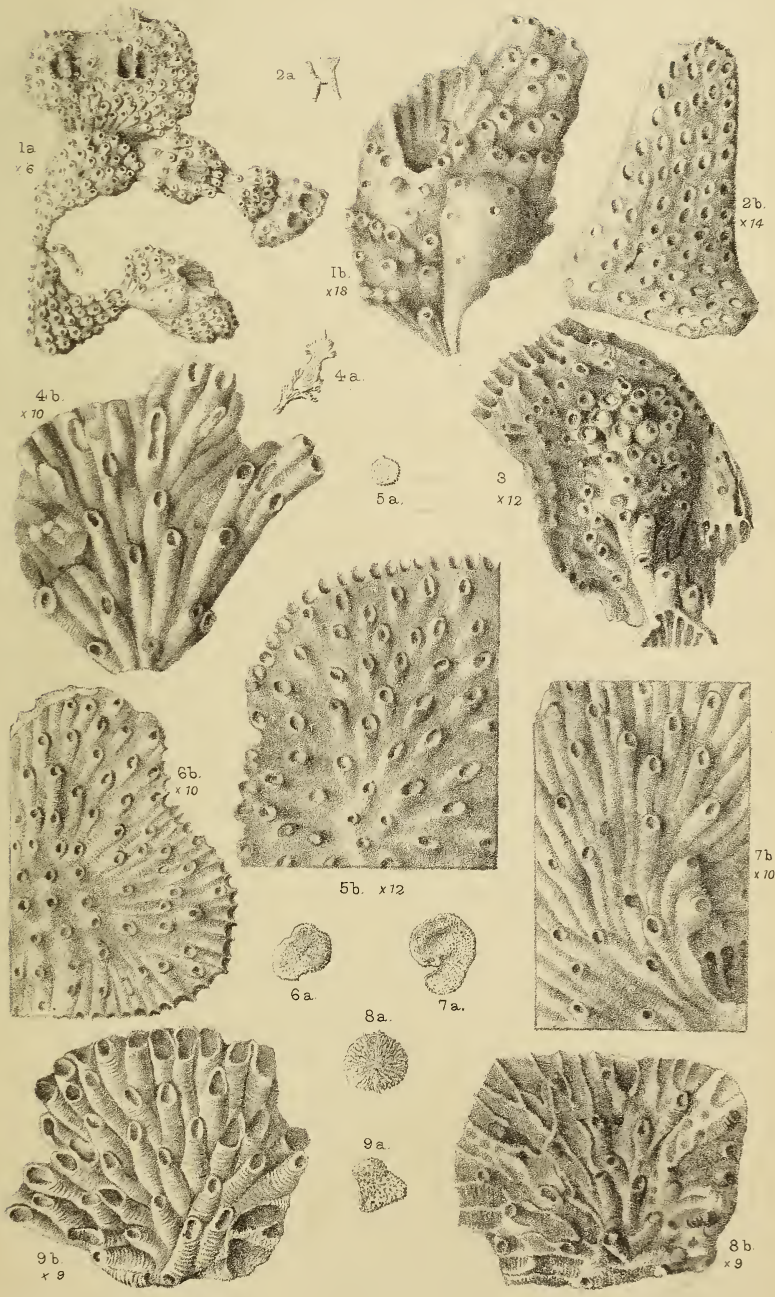
Fig. 5. *Berenicea gracilis* (Edw.), var. *tenuis* (Rss.). Middle Chalk: Chatham. Fig 5*a*, zoarium, nat. size; Fig. 5*b*, part of a zoarium, × 12 dia. Gamble Coll. [D. 382.]

Fig. 6. *Berenicea gracilis* (Edw.), var. *tenuis* (Rss.). Upper Chalk: Charlton. Fig. 6*a*, zoarium, nat. size; Fig. 6*b*, part of a zoarium, × 10 dia. Presented by G. C. Crick, Esq. [D. 3002.]

Fig. 7. *Berenicea papyracea* (Orb.). Middle Chalk: Chatham. Fig. 7*a*. zoarium, nat. size; Fig. 7*b*, part of a zoarium, × 10 dia. Gamble Coll. [D. 3884.]

Fig. 8. *Berenicea contracta*, Seeley. Upper Greensand: Cambridge. Fig. 8*a*, zoarium, nat. size; Fig. 8*b*, part of a zoarium, × 9 dia. Jesson Coll. [D. 2961.]

Fig. 9. *Berenicea contracta*, Seeley. Red Chalk: Hunstanton. Fig. 9*a*, zoarium, nat. size; Fig. 9*b*, part of a zoarium, × 9 dia. Jesson Coll. [D. 2009.]



E. Drake ad nat. lith.
West, Newman imp.

Proboscina & Berenecea.

BRITISH MUSEUM NATURAL HISTORY

PLATE V.

FIG. 1. *Berenicea gracilis* (Edw.). Lower Greensand: Isle of Wight. A zoarium encrusting *Choristopetalum impar*, × 8 dia. Morris Coll. [46,802.]

FIG. 2. *Berenicea diluviana*, Lamx. Cornbrash: loc. ? A young zoarium encrusting a *Zeilleria obovata* (Sow.), × 14 dia. Morris Coll. [50,774.]

FIG. 3. *Berenicea jessoni* (Vine). Upper Greensand: Cambridge. A small zoarium, × 14 dia. Jesson Coll. [D. 2964.]

FIG. 4. *Berenicea confluens* (Rss.). Upper Greensand: Cambridge A young zoarium, × 10 dia. Vine Coll. [D. 2981.]

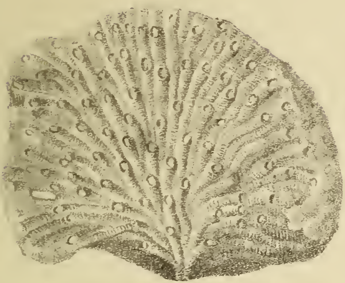
FIG. 5. *Berenicea polystoma* (Röm.). Middle Chalk: Chatham. A zoarium, × 10 dia. Vine Coll. [D. 2987.]

FIG. 6. *Berenicea papillosa* (Rss.). Middle Chalk: Chatham. A zoarium with a circular series of gonocysts, × 3 dia. Vine Coll. [D. 2614.]

FIG. 7. *Berenicea papillosa* (Rss.). Upper Chalk: Norwich. Fig. 7*a*, part of zoarium showing a gonocyst, × 16 dia.; Fig. 7*b*, part of margin of the same specimen with a young zoarium, × 10 dia. Bayfield Coll. [24,887.]

FIG. 8. *Berenicea papillosa* (Rss.). Middle Chalk: Chatham. A broken gonocyst with intra-gonocystal apertures, × 22 dia. Vine Coll. [D. 2982.]

FIG. 9. *Berenicea papillosa* (Rss.). Middle Chalk: Chatham. Part of a very thin zoarium, × 10 dia. Gamble Coll. [D. 3917.]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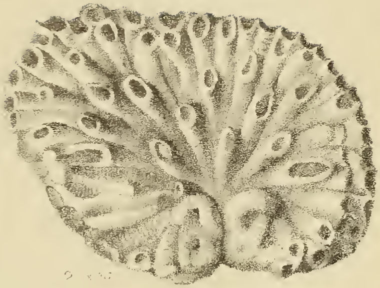
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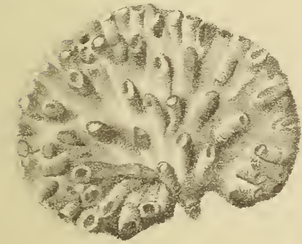
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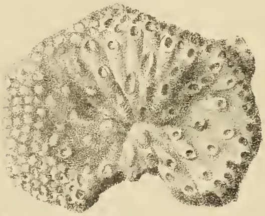
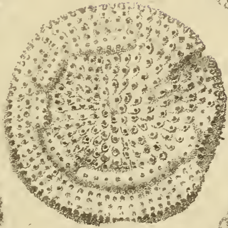
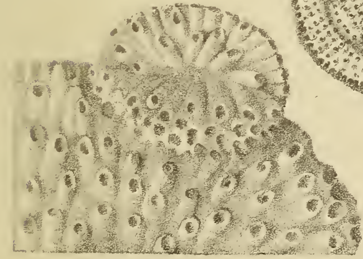
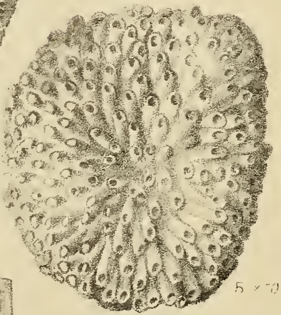
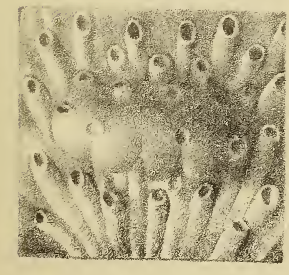

4. × 10

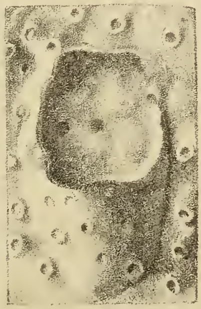

6. × 2

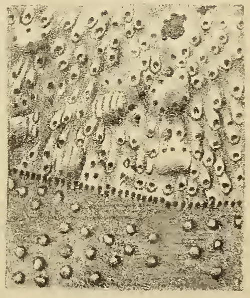

7b. × 10


5 × 10

7a. × 16




8. × 22


9

E. Drake ad nat. lith.

West, Newman imp.

Berenecea.

BRITISH MUSEUM
NATURAL HISTORY.

PLATE VI.

FIG. 1. *Berenicea polystoma* (Röm.). Middle Chalk: Chatham. Half of a worn zoarium, × 14 dia. Vine Coll. **[D. 960.]**

FIG. 2. *Berenicea disciformis* (Hag.). Chalk: loc. ? × 14 dia. Old Coll. **[D. 2988.]**

FIG. 3. *Reptomultisparsa megalopora* (Vine). Upper Greensand: Cambridge. A young zoarium, × 8 dia. Vine Coll. **[D. 1871.]**

FIG. 4. *Berenicea phlyctænosa*, Rss. Upper Chalk: Charlton. Part of a zoarium, × 10 dia. Presented by G. C. Crick, Esq. **[D. 3000.]**

FIG. 5. *Reptomultisparsa congesta* (Rss.). Upper Greensand: Cambridge. A young zoarium, the type of *D. fecunda*, Vine; × 7 dia. Vine Coll. **[B. 4452.]**

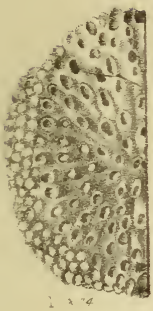
FIG. 6. *Reptomultisparsa congesta* (Rss.). Chalk Detritus: Charing. A young zoarium, × 10 dia. T. R. Jones Coll. **[D. 2861.]**

FIG. 7. *Berenicea regularis* (Orb.), var. *ambita*. Middle Chalk: Chatham. Part of a zoarium, × 10 dia. Gamble Coll. **[D. 3886.]**

FIG. 8. *Berenicea regularis* (Orb.), var. *gamblei*. Upper Chalk: S.E. England. Fig. 8*a*, whole zoarium, × 1½ dia.; Fig. 8*b*, part of a zoarium, × 10 dia. Purchased. **[B. 1756.]**

FIG. 9. '*Entalophora*' *obelioides*, Perg. Middle Chalk: Chatham. Part of a zoarium thus identified by M. Pergens, × 18 dia. The collection includes only this specimen, so that sections cannot be cut and the internal structure determined. Hence the species is not described. Gamble Coll. **[D. 4123.]**

FIG. 10. *Berenicea canui*, n.sp. Middle Chalk: Chatham. A zoarium, × 10 dia. Gamble Coll. **[D. 3870.**



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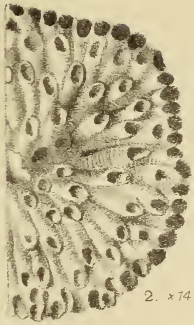

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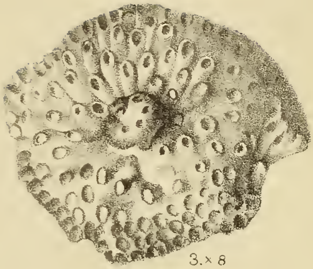
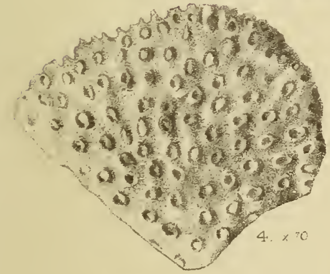
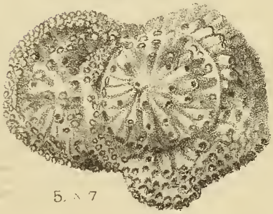


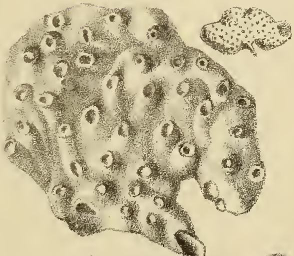
3. × 8



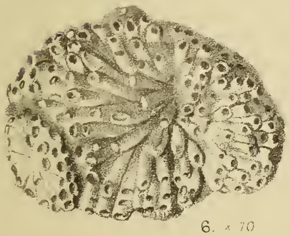
4. × 10



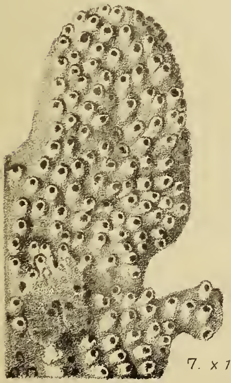
5. × 7



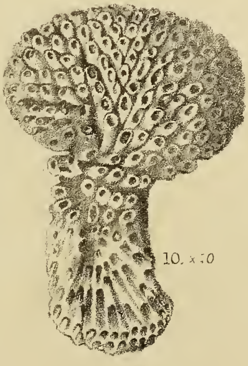
8. × 10



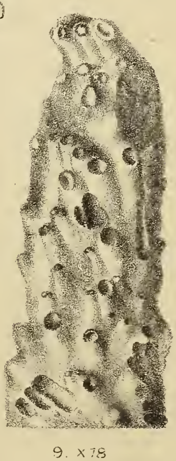
6. × 10



7. × 10



10. × 10



9. × 18

E. Drake ad nat, lith.

West, Newman imp

Berenecea &c.

BRITISH MUSEUM

PLATE VII.

Fig. 1. *Reptomultisparsa rowei*, n.sp. Middle Chalk: Chatham. Part of a zoarium, × 10 dia. Gamble Coll. [D. 3944.]

Fig. 2. *Reptomultisparsa sowerbyi* (Lonsd.). Chalk: Maidstone. Part of a zoarium, × 7 dia. Old Coll. [D. 2991.]

Fig. 3. *Reptomultisparsa congesta* (Rss.). Upper Chalk: Guildford. A nodular zoarium. Fig. 3*a*, upper surface, nat. size; Fig. 3*b*, part of the same from the side, × 7 dia. Capron Coll. [D. 3030.]

Fig. 4. *Berenicea spissa*, n.sp. Lower Greensand: Farringdon. Part of a zoarium, × 10 dia. Old Coll. [D. 5790.]

Fig. 5. *Berenicea acanthina*, n.sp. (on slide). Middle Chalk: Chatham. A zoarium, × 10 dia. Gamble Coll. [D. 429.]

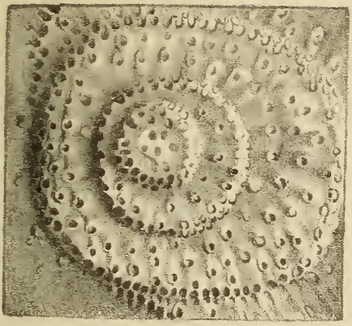
Fig. 6. *Berenicea jessoni* (Vine), var. *reniformis*. Middle Chalk: Chatham. A zoarium with two gonocysts, × 10 dia. Gamble Coll. [D. 4153.]

Fig. 7. *Berenicea regularis* (Orb.), var. *gamblei*. Cenomanian: Villers-sur-Mer. Margin of a zoarium, × 10 dia. Presented by William Hill, Esq. [D. 4386.]

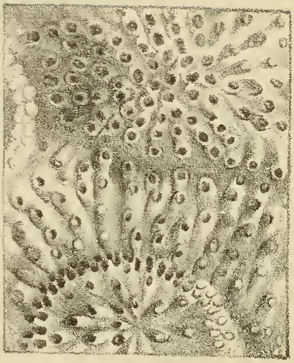
Fig. 8. *Berenicea regularis* (Orb.). Turonian — Craie marneuse: Villardin, Loir-et-Cher. A young zoarium, × 10 dia. Purchased 1898. [D. 4593.]

Fig. 9. *Berenicea regularis* (Orb.), var. *elliptica*. Middle Chalk: Chatham. A young zoarium, × 10 dia. Gamble Coll. [D. 3896.]

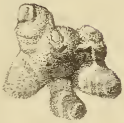
1. × 10



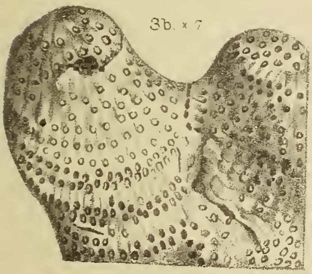
2. × 7



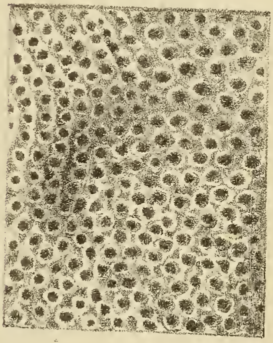
3 a.



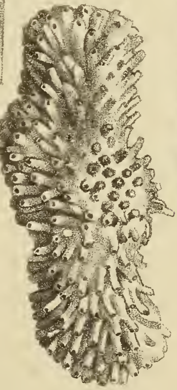
3b. × 7



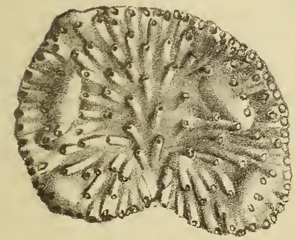
4. × 10



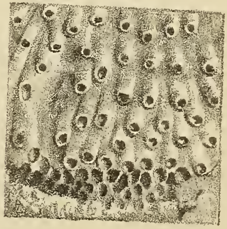
5. × 10



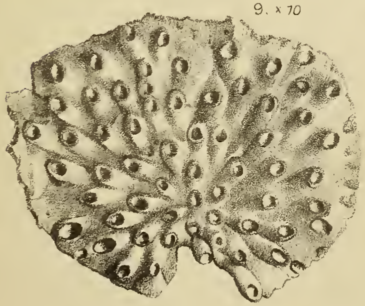
6. × 10



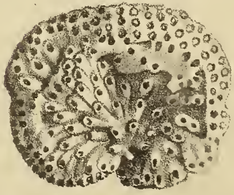
7. × 10



9. × 10



8. × 10



E Drake del et lith.

West, Newman imp.

Berenicea & Reptomultisparsa.

BRITISH MUSEUM
NATURAL HISTORY.

PLATE VIII.

Fig. 1. *Idmonea hagenowi* (Sharpe). Lower Greensand : Farringdon. Fig. 1*a*, part of a zoarium, × 5 dia. ; Fig. 1*b*, one of the zoarial ridges from the same seen from the side, × 5 dia. Cunnington Coll. [55,110.]

Fig. 2. *Idmonea alipes*, n.sp. Middle Chalk : Chatham. A zoarium with pinnately ribbed selvage, × 8 dia. Gamble Coll. [D. 465.]

Fig. 3. *Idmonea alipes*, n.sp. Middle Chalk : Chatham. A zoarium with a smooth selvage, × 7 dia. Gamble Coll. [D. 3843.]

Fig. 4. *Idmonea cristata* (Meun. & Perg.). Middle Chalk : Chatham. Fig. 4*a*, a zoarium seen from above, × 9 dia. ; Fig. 4*b*, side view of the same, × 9 dia. Vine Coll. [D. 712.]

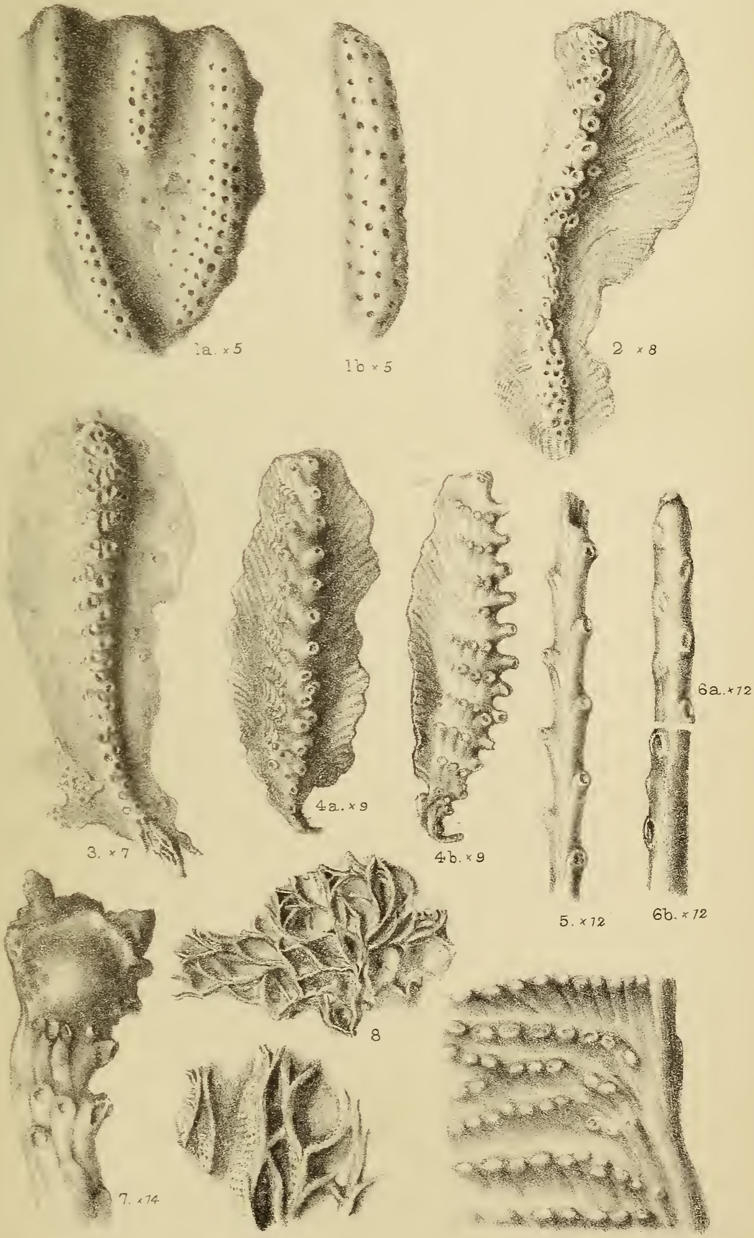
Fig. 5. *Crisina unipora*, Orb. Middle Chalk : Chatham. Obverse face of a branch, × 12 dia. Gamble Coll. [D. 3979.]

Fig. 6. *Crisina unipora*, Orb. Upper Chalk : Gravesend. Fig. 6*a*, upper part of the zoarium showing obverse face, × 12 dia. ; Fig. 6*b*, part of the side view of lower part of the same specimen, × 12 dia. Vine Coll. [D. 963.]

Fig. 7. *Crisina cenomana*, Orb., var. *triangularis*. Middle Chalk : Chatham. Part of a zoarium with gonœcium, × 14 dia. Vine Coll. [D. 973.]

Fig. 8. *Crisina* (*Reticrisina*) *obliqua* (Orb.). Upper Chalk: Sussex. A zoarium with flamboyant meshes, nat. size. Dixon Coll. [60,254.]

Fig. 9. *Crisina* (*Reticrisina*) *obliqua* (Orb.). Middle Chalk : Chatham. Fig. 9*a*, part of a zoarium from reverse face, × 2 dia. ; Fig. 9*b*, side view of one frond of the same, × 11 dia. Gamble Coll. [D. 3954.]



G.M.Woodward del. et lith.

West, Newman imp.

Idmonea, Crisina, & Reticrisina.

BRITISH MUSEUM
NATURAL HISTORY

PLATE IX.

FIG. 1. *Crisina* (*Reticrisina*) *papyracea* (Orb.). Middle Chalk: Chatham. Fig. 1*a*, obverse edge of part of a zoarium, × 10 dia.; Fig. 1*b*, side view of the same, × 10 dia.; Fig. 1*c*, reverse edge of the same, × 10 dia. Gamble Coll. [D. 3965.]

FIG. 2. *Reticrisina papyracea* (Orb.), form *complanata*, Mars. Middle Chalk: Chatham. Part of reverse edge of a zoarium, × 12 dia. Gamble Coll. [D. 385.]

FIG. 3. *Crisina* (*Reticrisina*) *papyracea* (Orb.). Chalk: Freshwater, Isle of Wight. A young zoarium, × 2 dia. Gardner Coll. [B. 70.]

FIG. 4. *Crisina* (*Tervia*) *subgracilis*, Orb., var. *depressa*. Middle Chalk: Chatham. A young zoarium, × 12 dia. Gamble Coll. [D. 526.]

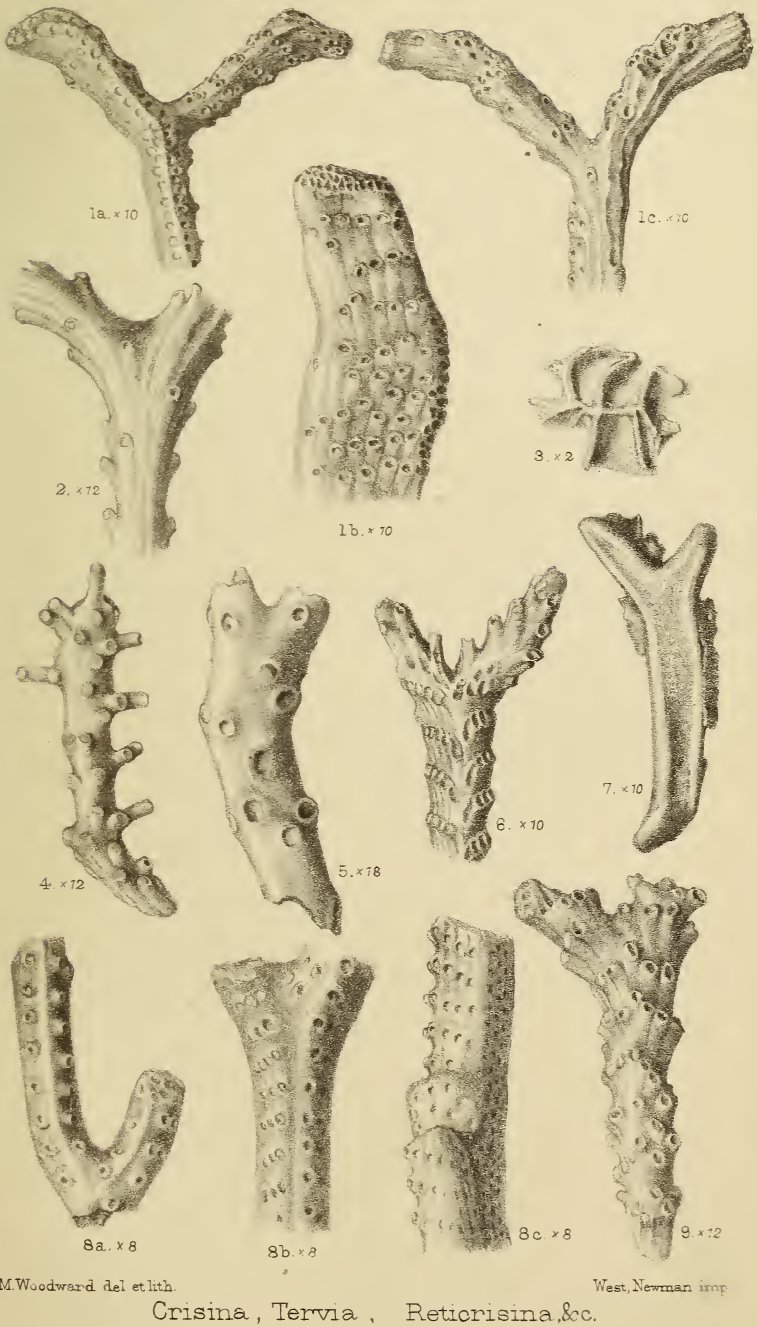
FIG. 5. *Crisina* (*Tervia*) *subgracilis*, Orb. Upper Chalk: Gravesend. Part of a branched zoarium, × 18 dia. Vine Coll. [D. 968.]

FIG. 6. *Crisina marginata* (Orb.). Middle Chalk: Chatham. Part of a zoarium, × 10 dia. Vine Coll. [D. 969.]

FIG. 7. *Crisina marginata* (Orb.). Middle Chalk: Chatham. Part of another zoarium, × 10 dia. Vine Coll. [D. 969.]

FIG. 8. *Retecava cretacea* (Edw.). Upper Chalk: Sussex. Three of Lonsdale's types. Fig. 8*a*, obverse edge of a branch, × 8 dia.; Fig. 8*b*, obverse edge of a lower part of the zoarium, × 8 dia.; Fig. 8*c*, side view of a branch, × 8 dia. Dixon Coll. [D. 2955.]

FIG. 9. *Crisina* (*Tervia*) *gamblei*, n.sp. Middle Chalk: Chatham. Obverse face of a zoarium, × 12 dia. Gamble Coll. [D. 4069.]



1a. × 10

1c. × 10

2. × 12

1b. × 10

3. × 2

4. × 12

5. × 18

6. × 10

7. × 10

8a. × 8

8b. × 8

8c. × 8

9. × 12

G M. Woodward del et lith.

West, Newman imp

Crisina, Tervia, Reticrisina, &c.

BRITISH MUSEUM NATURAL HISTORY

PLATE X.

FIG. 1. *Entalophora virgula* (Hag.), var. *raripora*, Orb. Middle Chalk : Chatham. × 6 dia. Gamble Coll. [D. 461.]

FIG. 2. *Entalophora virgula* (Hag.). Middle Chalk : Chatham. A zoarium of the typical variety, × 6 dia. Presented by W. Gamble, Esq. [D. 4516.]

FIG. 3. *Entalophora virgula* (Hag.), var. *alternata*, Orb. Upper Chalk : Bromley. A fragment of a zoarium, × 6 dia. Simmons Coll. [D. 2835.]

FIG. 4. *Entalophora virgula* (Hag.), var. *subgracilis*, Orb. Middle Chalk : Chatham. Part of a zoarium, × 6 dia. Gamble Coll. [D. 376.]

FIG. 5. *Entalophora pergensi*, n.sp. Middle Chalk : Chatham. Part of a zoarium, × 10 dia. Gamble Coll. [D. 4072.]

FIG. 6. *Entalophora pergensi*, n.sp. Middle Chalk : Chatham. Part of a zoarium, × 10 dia. Vine Coll. [D. 948.]

FIG. 7. *Entalophora pergensi*, n.sp. Middle Chalk : Chatham. A fragment of a zoarium with gonœcium, × 6 dia. Gamble Coll. [D. 418.]

FIG. 8. *Entalophora geminata* (Hag.). Middle Chalk : Chatham. Part of a zoarium, × 10 dia. Vine Coll. [D. 648.]

FIG. 9. *Entalophora horrida*, Orb. Chalk Powder : Slieve Gallion, co. Derry. Part of a zoarium, × 20 dia. Presented by J. Wright, Esq. [D. 3276.]

FIG. 10. *Entalophora echinata* (Röm.). Middle Chalk : Chatham. Upper part of a zoarium with gonocyst, × 20 dia. Vine Coll. [D. 657.]

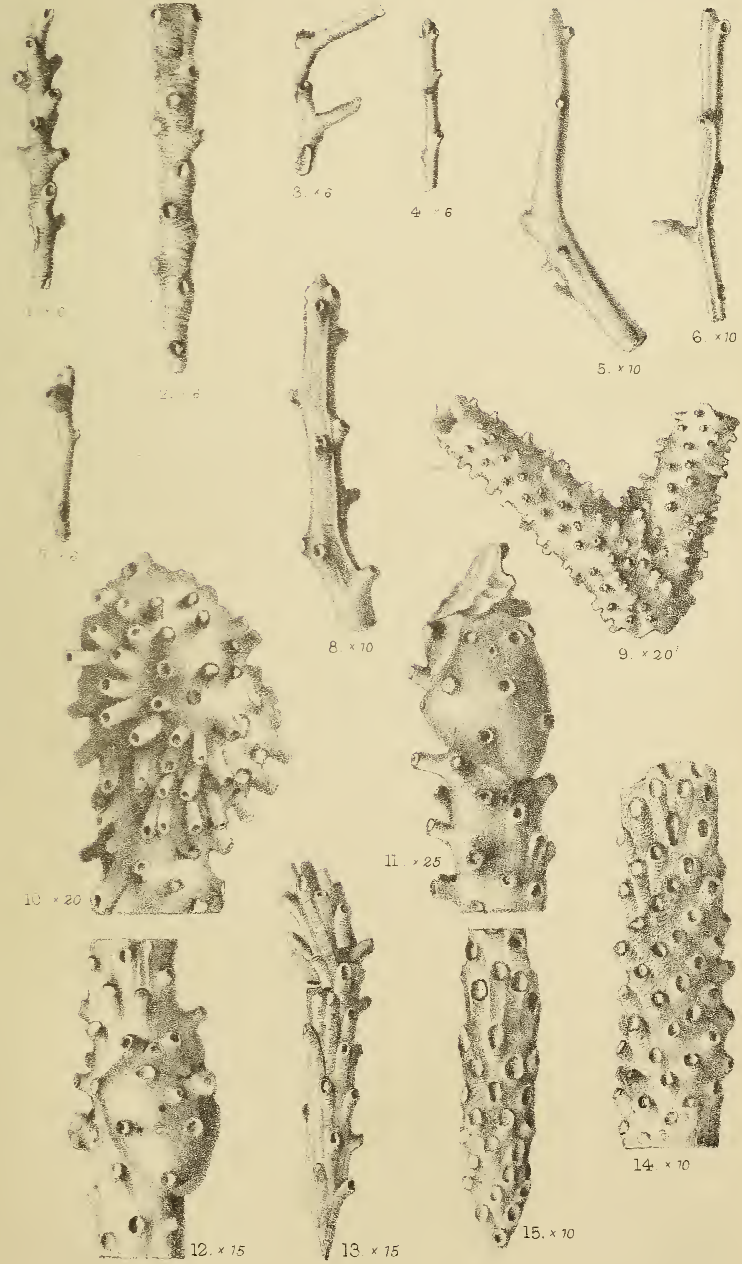
FIG. 11. *Entalophora echinata* (Röm.). Middle Chalk : Chatham. Part of a zoarium with a smaller gonocyst, × 25 dia. Vine Coll. [D. 2612.]

FIG. 12. *Entalophora echinata* (Röm.). Middle Chalk : Chatham. Part of a striated branch with gonocyst, × 15 dia. Vine Coll. [D. 2613.]

FIG. 13. *Entalophora echinata* (Röm.). Chalk : Kent. Part of a subclavate branch, × 15 dia. Bowerbank Coll. [D. 3108.]

FIG. 14. *Entalophora madreporacea* (Goldf.), var. *inconstans*. Upper Chalk : Afton Downs, I. of Wight. Part of a branch, × 10 dia. Presented by Mr. A. Hinton. [D. 2285.]

FIG. 15. *Entalophora madreporacea* (Goldf.), var. *benedeni*. Middle Chalk : Chatham. Fragment of a zoarium, × 10 dia. Gamble Coll [D. 4351.]



E. Drake ad nat lith.

West, Newman imp.

Entalophora.

BRITISH MUSEUM
NATURAL HISTORY.

PLATE XI.

Fig. 1. *Entalophora echinata* (Röm.). Middle Chalk: Chatham. Base of a zoarium, × 7 dia. Gamble Coll. [D. 4209.]

Fig. 2. *Entalophora virgula* (Hag.), var. *raripora*. Middle Chalk: Chatham. A young zoarium with base, × 7 dia. Gamble Coll. [D. 4512.]

Fig. 3. *Entalophora*, sp. Middle Chalk: Chatham. Base of a zoarium, × 7 dia. Gamble Coll. [D. 4510.]

Fig. 4. *Entalophora gigantopora*, Vine. Upper Greensand: Cambridge. Part of a branch, × 10 dia. Vine Coll. [B. 4450.]

Fig. 5. *Spiropora verticillata* (Goldf.). Middle Chalk: Chatham. Part of a zoarium with verticillate and spiral rows of apertures, × 7 dia. Gamble Coll. [D. 420.]

Fig. 6. *Spiropora macropora* (Orb.). Upper Chalk: Salisbury. Two parts of the same zoarium, one spiral and one verticillate; × 10 dia. Vine Coll. [D. 946.]

Fig. 7. *Spiropora macropora* (Orb.), var. *micropora*. Middle Chalk: Chatham. A zoarium partly verticillate and partly pinnate, × 7 dia. Middle Chalk: Chatham. Vine Coll. [D. 662.]

Fig. 8. *Spiropora macropora* (Orb.), var. *semilaterotubigera*. Middle Chalk: Chatham. Fig. 8*a*, branch from the side, × 7 dia.; Fig. 8*b*, end view of the same, × 7 dia. Gamble Coll. [D. 470.]

Fig. 9. *Spiropora macropora* (Orb.), var. *jessoni*. Upper Greensand: Cambridge. Part of Vine's type of *jessoni*, × 10 dia. [B. 4449.]

Fig. 10. *Spiropora macropora* (Orb.), var. *jessoni*. Upper Greensand: Cambridge. Part of base of a stem, × 11 dia. Vine Coll. [D. 4447.]

Fig. 11. *Crisina* (*Tervia*) *subgracilis*, Orb. Middle Chalk: Chatham. Side view of part of a branch with gonœcium, × 10 dia. Gamble Coll. [D. 4068.]

Fig. 12. *Entalophora cretacea* (Orb.). Middle Chalk: Chatham. Part of a zoarium with two gonœcia, × 10 dia. Gamble Coll. [D. 416.]

Fig. 13. *Entalophora virgula* (Hag.), var. *inconstans*. Middle Chalk: Chatham. Part of a zoarium with gonœcium, × 10 dia. Gamble Coll. [D. 4067.]

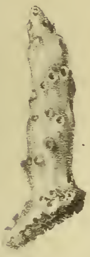
Fig. 14. *Meliceritites* (*Chisma*) *furcillata* (Lonsd.). Atherfield Clay: east of Ladder, Shanklin. Part of a branch with the front wall partially preserved, × 15 dia. Caleb Evans Coll. [D. 2007.]

Fig. 15. *Meliceritites* (*Chisma*) *furcillata* (Lonsd.). Atherfield Clay: Atherfield. Longitudinal section, the specimen figured by Lonsdale, Quart. Journ. Geol. Soc. vol. v. pl. v. fig. 26; × 7 dia. Morris Coll. [D. 4545.]

Fig. 16. *Entalophora virgula* (Hag.). Upper Chalk: Gravesend. A worn fragment, × 10 dia. Vine Coll. [D. 1001.]

Fig. 17. *Entalophora echinata* (Röm.). Middle Chalk: Chatham. A zoarium partly striated, × 11 dia. Gamble Coll. [D. 4066.]

Fig. 18. *Entalophora virgula* (Hag.). Upper Greensand: Cambridge. Part of Vine's type of *E. proboscidea, elegans*, × 10 dia. Vine Coll. [B. 4447.]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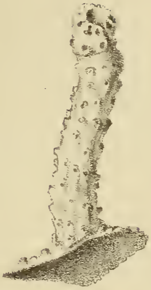
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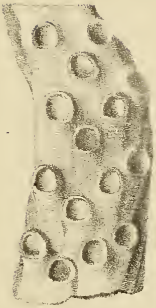
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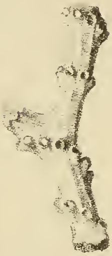
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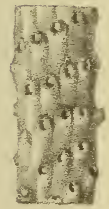
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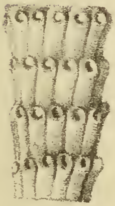
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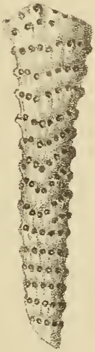
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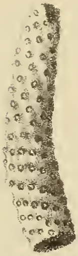
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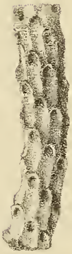
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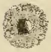
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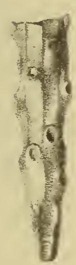
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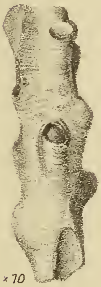
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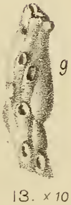

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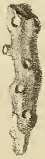
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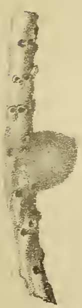
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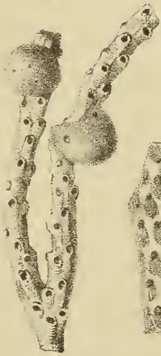
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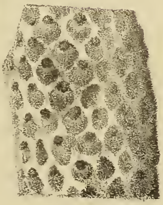
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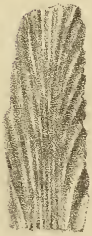
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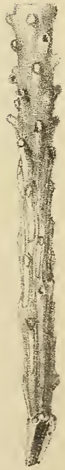

17. × 11

E. Drake ad nat lith.

West Newman imp.

Entalophora, Spiropora &c.

BRITISH MUSEUM
NATURAL HISTORY

PLATE XII.

Fig. 1. *Clinopora lineata* (Beiss.). Middle Chalk : Chatham. Part of a branch, × 10 dia. Vine Coll. [D. 660.]

Fig. 2. *Siphoniotyphlus tenuis* (Hag.). Middle Chalk : Chatham. Part of a narrow zoarium, × 10 dia. Vine Coll. [D. 2741.]

Fig. 3. *Clinopora spinigera*, n.sp. Chalk Detritus : Charing, Kent. A zoarium, × 12 dia. T. R. Jones Coll. [D. 2821.]

Fig. 4. *Clinopora spinigera*, n.sp. Chalk Detritus : Charing, Kent. A thin longitudinal section, × 10 dia. T. R. Jones Coll. [D. 4940.]

Fig. 5. *Siphoniotyphlus tenuis* (Hag.). Chalk Detritus : Charing, Kent. Part of a wide zoarium, × 10 dia. T. R. Jones Coll. [D. 2829.]

Fig. 6*a*. *Siphoniotyphlus plumatus*, Lonsd. Middle Chalk : Chatham. Part of a thin longitudinal section, × 10 dia. Vine Coll. [D. 703.]

Fig. 6*b*. *Siphoniotyphlus plumatus*, Lonsd. Upper Chalk—Zone of *Belemnitella mucronata* : Clarendon, near Salisbury. Upper part of a zoarium of which the lower part has a thin selvage and regularly pinnate apertures, × 10 dia. Gamble Coll. [D. 4324.]

Fig. 7. *Petalopora pulchella* (Röm.). Upper Chalk : Sussex. Part of a specimen figured by Lonsdale, × 10 dia. Dixon Coll. [B. 4485.]

Fig. 8. *Petalopora costata* (Orb.). Chalk : Dover. Longitudinal section of the basal part of a branch, × 10 dia. Bowerbank Coll. [D. 7062.]

Fig. 9. *Petalopora costata* (Orb.). Middle Chalk : Chatham. Fig. 9*a*, base of a branch, nat. size ; Fig. 9*b*, part of the same, × 18 dia. Gamble Coll. [D. 4514.]

Fig. 10. *Petalopora costata* (Orb.). Middle Chalk : Chatham. Part of a branch of var. *appendiculata*, × 10 dia. Vine Coll. [D. 713.]

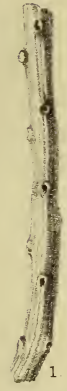
Fig. 11. *Petalopora cunningtoni*, n.sp. Lower Greensand : loc. ? Fig. 11*a*, a zoarium, nat. size ; Fig. 11*b*, branch of the same, × 10 dia. Presented by F. Harford, Esq. [D. 2301].

Fig. 12. *Petalopora cunningtoni*, n.sp. Lower Greensand : Farringdon. Longitudinal section, × 10 dia. Cunnington Coll. [D.5130].

Fig. 13. *Petalopora cunningtoni*, n.sp. Lower Greensand : Farringdon. Part of a branch, × 10 dia. Cunnington Coll. [D. 7104.]

Fig. 14. *Siphodictyum gracile*, Lonsd. Lower Greensand : Folkestone. Fig. 14*a*, part of obverse surface, × 8 dia. ; Fig. 14*b*, a thin slice from a branch of the same, showing longitudinal and transverse sections, × 12 dia. Caleb Evans Coll. [D. 3023.]

Fig. 15. *Siphodictyum gracile*, Lonsd. Lower Greensand : Folkestone. Part of obverse surface of a well ; preserved specimen, × 10 dia. Gardner Coll. [D. 3153.]



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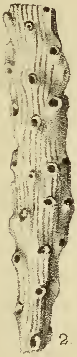

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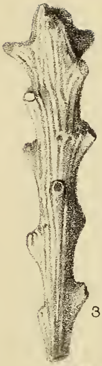

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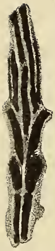

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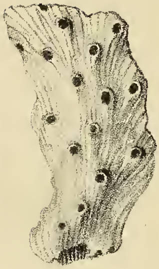

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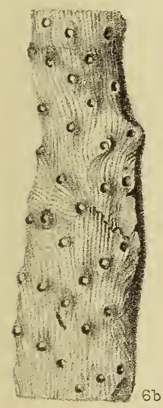
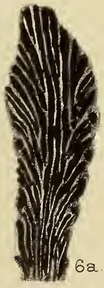


6b. × 10



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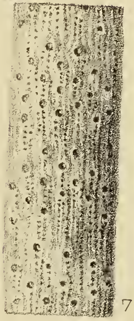

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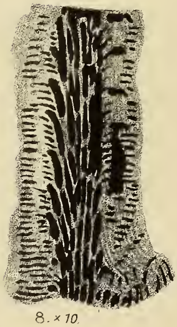

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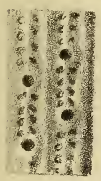
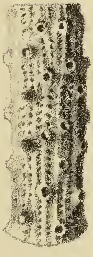


9b. × 3

9a.



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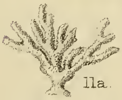
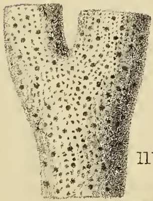
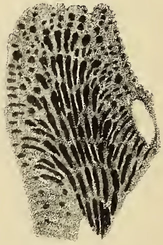


11a.



11b. × 10



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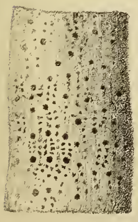

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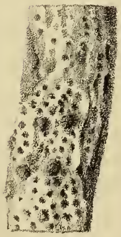
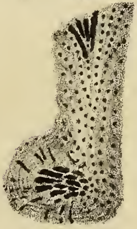
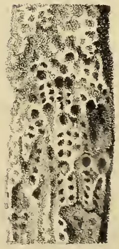


14a × 8



14b × 12



15 × 10

E. Drake del. et lith.

West, Newman imp.

Clinopora, Petalopora. &c.

BRITISH MUSEUM
NATURAL HISTORY

PLATE XIII.

Fig. 1. *Sparsicavea carantina*, Orb. Middle Chalk: Chatham. A branch of which the upper part is in the form *carantina* and the lower in that of *francqana*, × 10 dia. Vine Coll. [D. 695.]

Fig. 2. *Sparsicavea carantina*, Orb. Middle Chalk: Chatham. A branch with the radial ribbing indistinct, × 10 dia. Vine Coll. [D. 2623.]

Fig. 3. *Sparsicavea carantina*, Orb. Middle Chalk: Chatham. A worn zoarium with the cancellate wall removed, × 10 dia. Vine Coll. [D. 698.]

Fig. 4. *Sparsicavea carantina*, Orb. Middle Chalk: Chatham. A branch of which the upper part has been cut down to show the maculæ, × 10 dia. Vine Coll. [D. 721.]

Fig. 5. *Sparsicavea carantina*, Orb. Middle Chalk: Chatham. A branch of the form *francqana*, × 12 dia. Gamble Coll. [D. 4071.]

Fig. 6. *Sparsicavea carantina*, Orb. Upper Chalk: Croydon. A branch with gonocyst, × 10 dia. Old Coll. [D. 4479.]

Fig. 7. *Sparsicavea carantina*, Orb. Middle Chalk: Chatham. A branch of form *francqana* with gonocyst, × 10 dia. Gamble Coll. [D. 432.]

Fig. 8. *Clausa francqana* (Orb.). Upper Chalk: Kent. Part of a branch with bare proximal end, × 10 dia. Simmons Coll. [40,363.]

Fig. 9. *Clausa francqana* (Orb.). Chalk: South-East England. Part of a fusiform branch with a short bare end, × 8 dia. T. Smith Coll. [D. 4564.]

Fig. 10. *Clausa francqana* (Orb.). Middle Chalk: Chatham. Upper part of a zoarium with a bare distal end, × 10 dia. Gamble Coll. [D. 433.]

Fig. 11. *Clausa francqana* (Orb.). Upper Chalk: Bromley. A branched zoarium with bare proximal end, × 9 dia. Simmons Coll. [D. 2840.]

Fig. 12. *Clausa francqana* (Orb.). Middle Chalk: Chatham. A thin branch with long, narrow, bare proximal end, × 10 dia. Vine Coll. [D. 2720.]

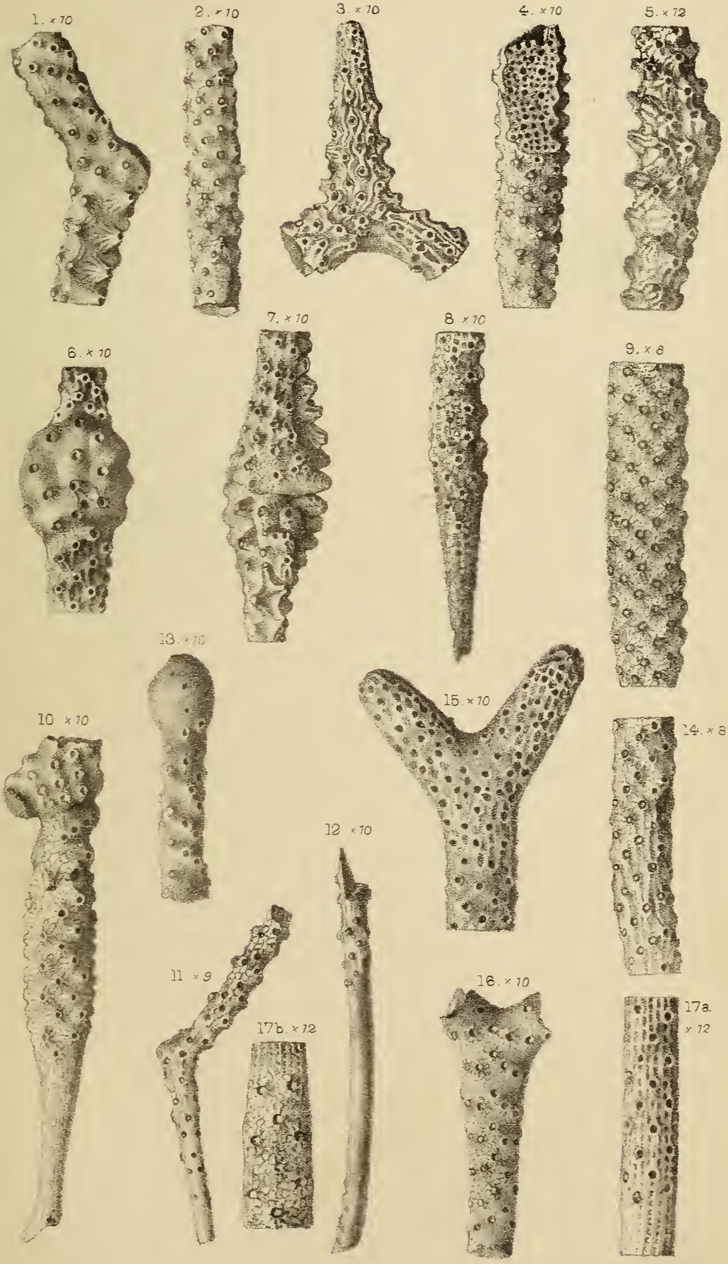
Fig. 13. *Clausa francqana* (Orb.). Middle Chalk: Chatham. The distal end of a zoarium, with gonocyst, × 10 dia. Gamble Coll. [D. 437.]

Fig. 14. *Sparsicavea wrighti*, n.sp. Upper Chalk: Bromley. Part of a stem, × 8 dia. Simmons Coll. [D. 2834.]

Fig. 15. *Clausa heteropora* (Orb.). Middle Chalk: Chatham. A branch, 10 dia. Vine Coll. [D. 2711.]

Fig. 16. *Clausa irregularis* (Orb.). Upper Chalk: Salisbury. Branched fragment, × 10 dia. Vine Coll. [D. 2651.]

Fig. 17. *Sparsicavea wrighti*, n.sp. Chalk Powder: Slieve Gallion, co. Derry. Fig. 17*a*, part of a stem, × 12 dia.; Fig. 17*b* is the lower continuation of 17*a*, × 12 dia. J. Wright Coll. [D. 3277.]



E.Drake ad.nat.lith.
West,Newman imp.

Clausa - Sparsicavea.

BRITISH MUSEUM
NATURAL HISTORY

PLATE XIV.

Fig. 1. *Meliceritites semiclausa* (Mich.), on slide. Cenomanian: Le Mans. Fig. 1*a*, a zoarium, nat. size; Fig. 1*b*, the distal end of a branch, × 10 dia.; Fig. 1*c*, zoœcia on the lower part of the same branch, × 10 dia.; Fig. 1*d*, part of the base of the same, × 10 dia. Tesson Coll. [D. 4521.]

Fig. 2. *Meliceritites semiclausa* (Mich.), on slide. Cenomanian: Le Mans. Branch with an avicularium (*a*), × 14 dia. Tesson Coll. [D. 4523.]

Fig. 3. *Meliceritites semiclausa* (Mich.). Upper Greensand: Warminster. Part of a worn branch, × 10 dia. Cunnington Coll. [60,539.]

Fig. 4. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Part of a zoarium with closed zoœcia and a broken gonocyst, × 15 dia. Vine Coll. [D. 2718.]

Fig. 5. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Part of a branch with tumid zoœcia, × 8 dia. Gamble Coll. [D. 4112.]

Fig. 6. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Part of a branch with larger angular zoœcia, × 10 dia. Vine Coll. [D. 2699.]

Fig. 7. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Part of a branch with zoœcia closed by caps perforated by double pores, × 10 dia. Gamble Coll. [D. 351.]

Fig. 8. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Part of a zoarium showing interior of a gonocyst, × 16 dia. Gamble Coll. [D. 3997.]

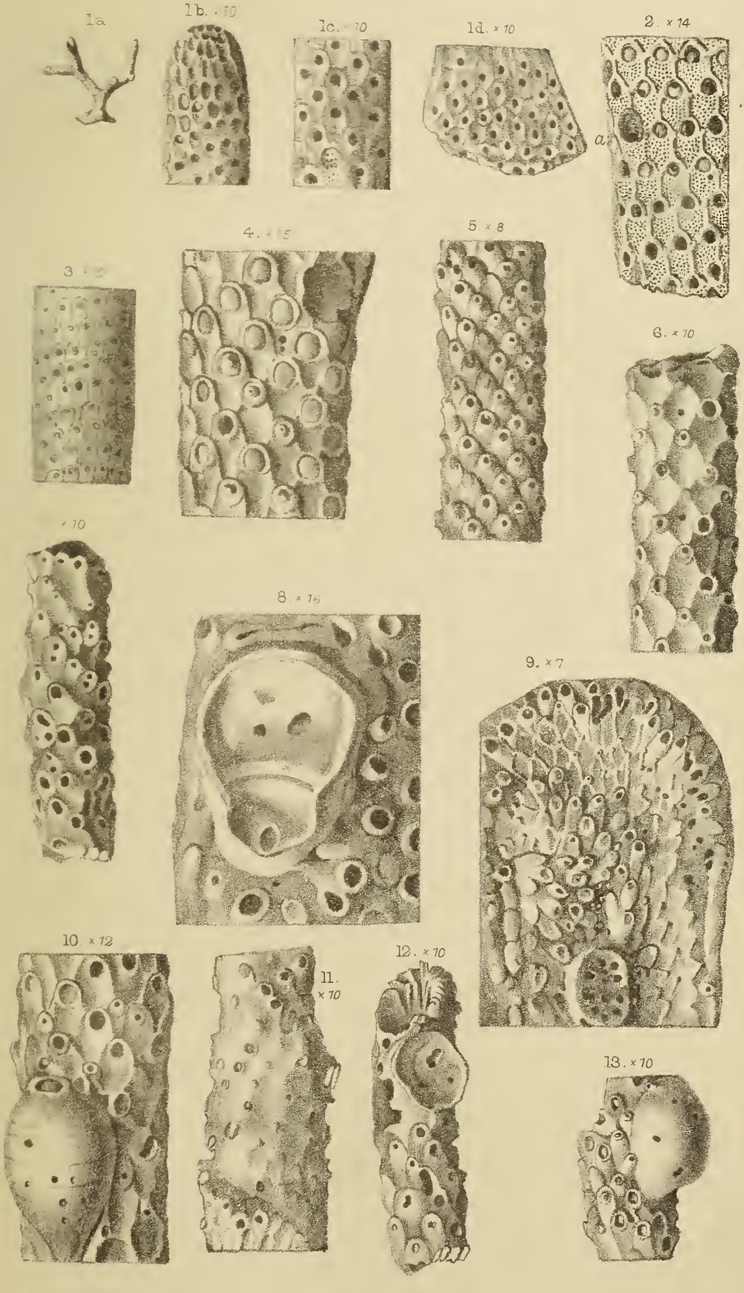
Fig. 9. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Base of a zoarium, × 7 dia. Gamble Coll. [D. 4243.]

Fig. 10. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. A branch with a piriform gonocyst, × 12 dia. Gamble Coll. [D. 3996.]

Fig. 11. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Part of a zoarium with an epithecal layer, × 10 dia. Gamble Coll. [D. 3992.]

Fig. 12. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. Part of a thin branch with broken gonocysts, × 10 dia. Gamble Coll. [D. 359.]

Fig. 13. *Nodelea durobrivensis*, n.sp. Middle Chalk: Chatham. A branch with a complete gonocyst, × 10 dia. Gamble Coll. [D. 359.]



E. Drake del. et lith.

West, Newman imp.

Haplocecia.

BRITISH MUSEUM NATURAL HISTORY

PLATE XV.

Fig. 1. *Meliceritites parviarmata*, n.sp. Middle Chalk : Chatham. A branch, × 12 dia. Gamble Coll. [D. 4529.]

Fig. 2. *Meliceritites undata* ? Orb. Upper Chalk : Gravesend. Part of a branch with some closed zoœcia and probably an inverted avicularium, × 20 dia. Vine Coll. [D. 630.]

Fig. 3. *Meliceritites undata*, Orb. Upper Chalk : Beachy Head. Part of a zoarium, × 18 dia. [D. 7107.]

Fig. 4. *Meliceritites undata*, Orb. Middle Chalk : Chatham. Part of a zoarium, × 11 dia. Gamble Coll. [D. 489.]

Fig. 5. *Meliceritites lonsdalei*, n.sp. Middle Chalk : Chatham. A thin branch with avicularium and gonocyst, × 10 dia. Gamble Coll. [D. 4204.]

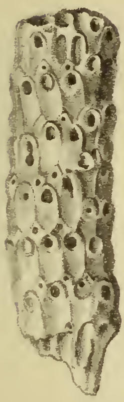
Fig. 6. *Meliceritites lonsdalei*, n.sp., var. *dollfusi*, Perg. Upper Chalk : Wiltshire. Fig. 6*a*, a zoarium, nat. size ; Fig. 6*b*, part of a branch of the same with spatulate avicularium, × 10 dia. ; Fig. 6*c*, a basal avicularium on a spine, × 15 dia. Presented by the late Rev. P. B. Brodie. [D. 2298.]

Fig. 7. *Meliceritites lonsdalei*, n.sp. Upper Chalk : Sussex. One of Lonsdale's figured specimens, × 10 dia. Dixon Coll. [B. 4491.]

Fig. 8. *Meliceritites lonsdalei*, n.sp. Middle Chalk : Chatham. Part of base of a zoarium, × 10 dia. Gamble Coll. [D. 4257.]

Fig. 9. *Meliceritites lonsdalei*, n.sp. Upper Chalk : Sussex. The lower branch of a zoarium, one of Lonsdale's figured specimens ; × 11 dia. Figd. Dixon, Geol. Suss. pl. xviii. A, fig. 8*d*. Dixon Coll. [60,344.]

Fig. 10. *Meliceritites fistulata*, n.sp. Middle Chalk : Chatham. Fig. 10*a*, zoarium, × 2 dia. ; Fig. 10*b*, part of a branch, × 16 dia. Vine Coll. [D. 4562.]



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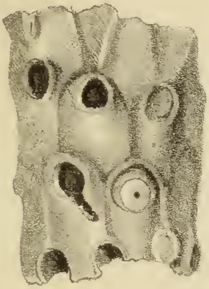

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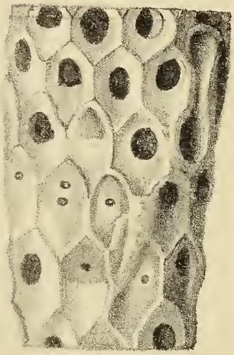

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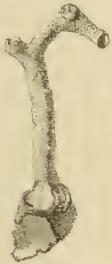
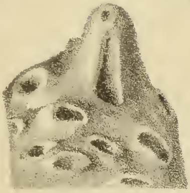
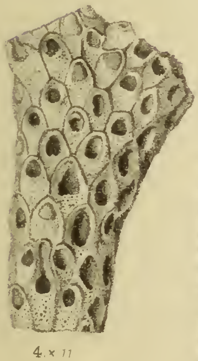


6a.



6c. × 15



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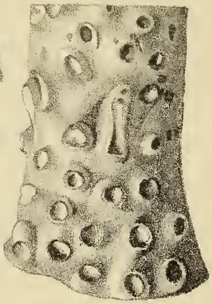
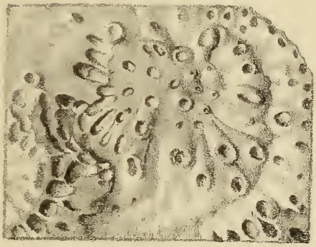
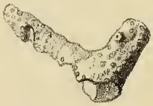


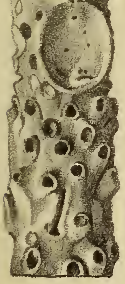
6b. × 10



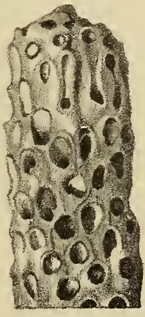
8. × 10



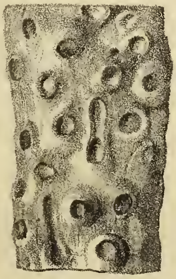
10a. × 2



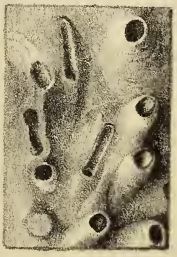
5. × 10



7. × 10



9. × 11



10b. × 16

E. Drake del. et lith.

West, Newman imp.

Elæidæ.

BRITISH MUSEUM NATURAL HISTORY

PLATE XVI.

FIG. 1. *Meliceritites propinqua* (Mars.). Middle Chalk: Chatham. Some zoœcia and an avicularium, × 28 dia. Gamble Coll. [D. 4116.]

FIG. 2. *Meliceritites propinqua* (Mars.). Chalk: Dover. Part of a branch, × 14 dia. Bowerbank Coll. [D. 4520.]

FIG. 3. *Meliceritites undata*, Orb. Middle Chalk: Chatham. Distal end of a branch, partly in the Ceid condition; × 16 dia. Gamble Coll. [D. 3995.]

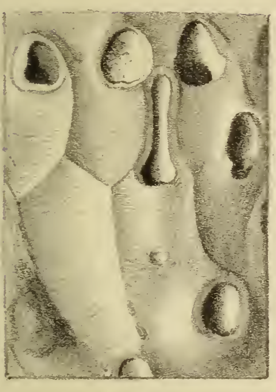
FIG. 4. *Inversaria orbicularis*, n.sp. Upper Greensand: Warminster. Fig. 4*a*, a branch, nat. size; Fig. 4*b*, part of the same, × 12 dia. Baker Coll. [D. 3168.]

FIG. 5. *Inversaria laminata*, n.sp. Upper Chalk: Ludsdon. Fig. 5*a*, part of a branch, × 6 dia.; Fig. 5*b*, a worn part of the same, × 10 dia. Bowerbank Coll. [D. 3104.]

FIG. 6. *Reptoceritites rowei*, n.sp. Middle Chalk: Chatham. Fig. 6*a*, whole zoarium, nat. size; Fig. 6*b*, part of the same, × 14 dia. Gamble Coll. [D. 4244.]

FIG. 7. *Reptomultelea sarissata*, n.sp. Upper Chalk: Beachy Head. Part of the surface, × 10 dia. Presented by the author. [D. 7106.]

FIG. 8. *Foricula aspera*, Orb. Middle Chalk: Chatham. Some zoœcia, × 10 dia. Gamble Coll. [D. 355.]



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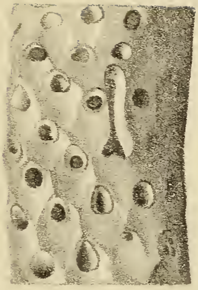

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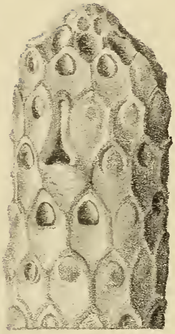
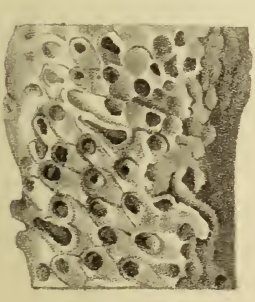
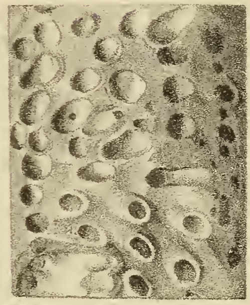


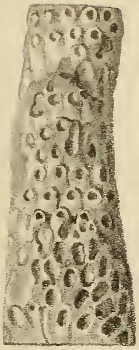
3. × 16



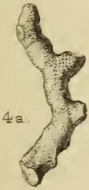
4 b. ×12



5 b. ×10

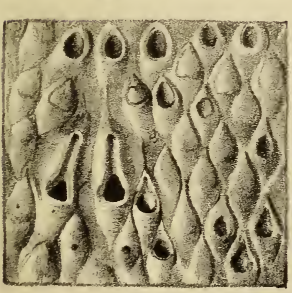


5a. × 6

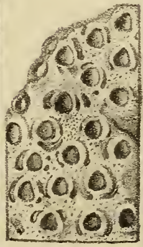


4a.

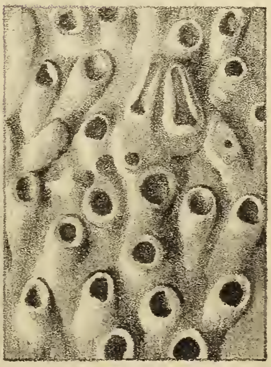
6a.



7. × 10



8 ×10



6b. × 14

E. Drake del. et lith.

West, Newman imp

Elæidæ.

BRITISH MUSEUM NATURAL HISTORY.

PLATE XVII.

Fig. 1. *Clausa globulosa* (Orb.). Upper Chalk : Bromley. Fig. 1*a*, a zoarium of var. *tenuicaulata*, nat. size ; Fig. 1*b*, the head of the same, × 12 dia. ; Fig. 1*c*, part of the stem of the same, × 12 dia. Bowerbank Coll. [D. 3089.]

Fig. 2. *Clausa globulosa* (Orb.). Middle Chalk : Chatham. Fig. 2*a*, a zoarium of var. *crassicaulata*, nat. size ; Fig. 2*b*, the head of the same, × 8 dia. ; Fig. 2*c*, part of the stem of the same, × 8 dia. Gamble Coll. [D. 4555.]

Fig. 3. *Clausa globulosa* (Orb.). Upper Chalk : South-East England. Head of a zoarium, × 10 dia. Toulmin Smith Coll. [D. 4556.]

Fig. 4. *Clausa globulosa* (Orb.). Middle Chalk : Chatham. Part of a zoarium with high peristomes, × 10 dia. Gamble Coll. [D. 4563.]

Fig. 5. *Clausa globulosa* (Orb.). Middle Chalk : Chatham. Part of a zoarium of var. *crassicaulata*, with long, free peristome ; × 10 dia. Gamble Coll. [D. 4559.]

Fig. 6. *Clausa globulosa* (Orb.). Middle Chalk : Chatham. Base of a zoarium of form *elegans*, × 6 dia. Gamble Coll. [D. 4100.]

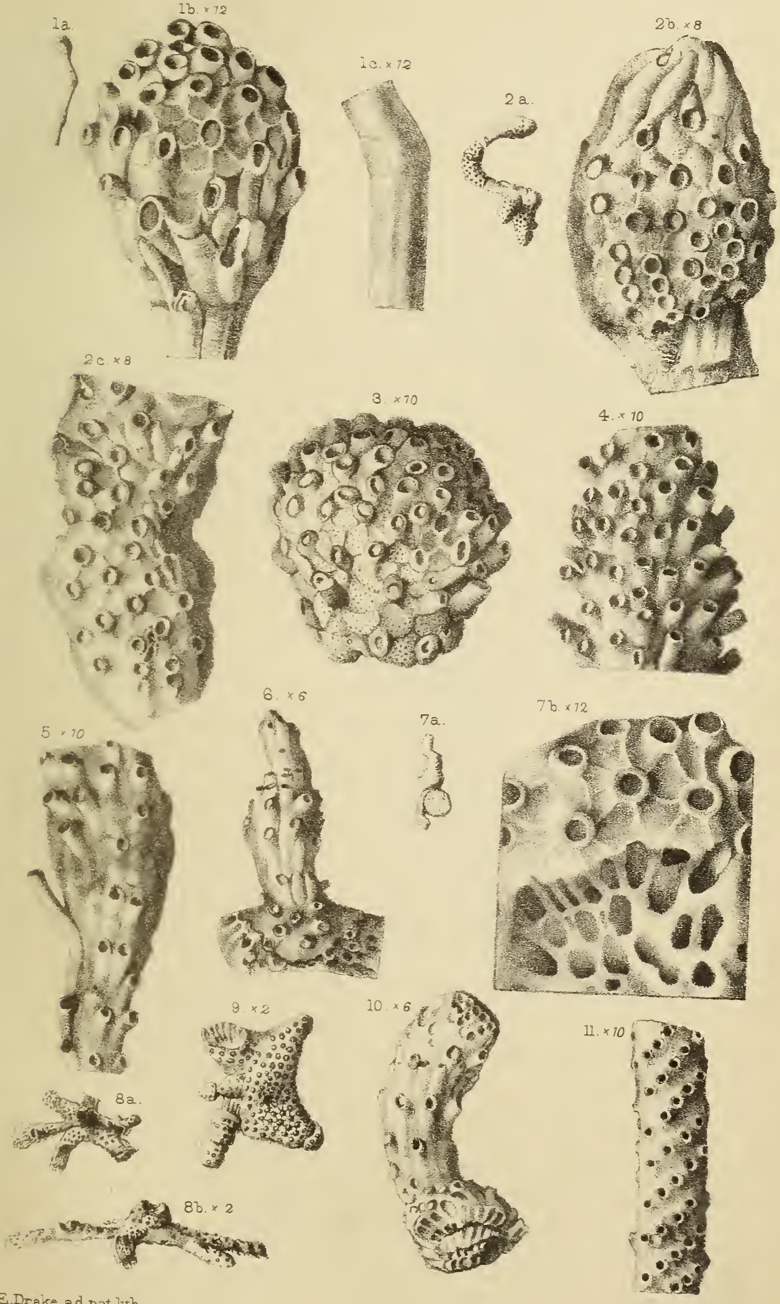
Fig. 7. *Cryptoglena gamblei*, n.sp. Middle Chalk : Chatham. Fig. 7*a*, a zoarium, nat. size ; Fig. 7*b*, part of the same, × 12 dia. Gamble Coll. [D. 4064.]

Fig. 8. *Clausa globulosa* (Orb.). Middle Chalk : Chatham. Fig. 8*a*, base of a zoarium, nat. size ; Fig. 8*b*, the same from the side, × 2 dia. Gamble Coll. [D. 4197.]

Fig. 9. *Cryptoglena gamblei*, n.sp. Middle Chalk : Chatham. A zoarium, × 2 dia. Gamble Coll. [D. 4260.]

Fig. 10. *Clausa globulosa* (Orb.). Middle Chalk : Chatham. A branch of the form *elegans*, × 6 dia. Vine Coll. [D. 628.]

Fig. 11. *Clausa heteropora* (Orb.). Middle Chalk : Chatham. A branch of var. *obliqua*, × 10 dia. Vine Coll. [D. 699.]



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Clausidæ.

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E. RAY LANKESTER,
Director.

British Museum
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